METAL FINISHING

PREPARATION, ELECTROPLATING, COATING

PUBLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY

Read

A superior Method of

CONTROLLING ALKALI CLEANER BATHS

in the **NEW**

HANSON-VAN WINKLE-MUNNING CO.

Cleaner Bulletin

A complete line of Quality ...ATING EQUIPMENT *and* SUPPLIES

CLEANERS

A new method, developed by Hanson-Van Winkle-Munning engineers, for measuring the quantity of AVAILABLE ALKALI in cleaner baths, is only one of the valuable features covered in "Cleaners for Effective Metal Cleaning". Included also are operating suggestions, a section on metal cleaning processes, descriptions of Hanson-Van Winkle-Munning Soap and Alkali (both Soak and Electric) Cleaners, charts, graphs, and many helpful suggestions on the selection and control of alkali cleaners.

This bulletin answers many of the most frequently asked questions on metal cleaning. It will bring you up-to-date on latest practices, and may help you to do a better job. (Useful, too, in training green help.)

Send for your copy today. Ask for Bulletin C-105.

HANSON-VAN WINKLE-MUNNING CO.

MATAWAN, NEW JERSEY

PLANTS: . . Matawan, New Jersey . . Anderson, Indiana . . Bridgeport, Connecticut

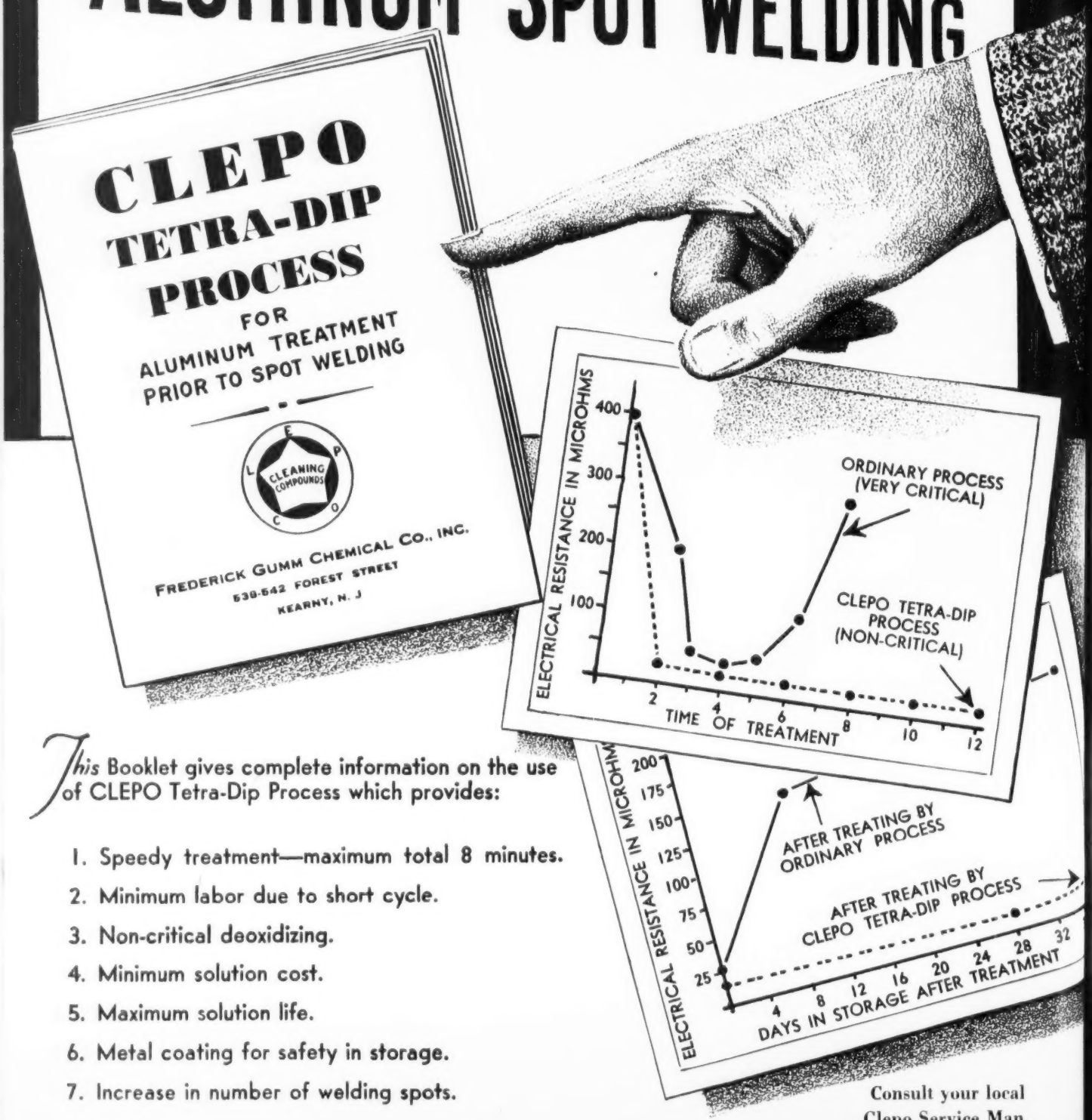
SALES OFFICES: Anderson · Bridgeport · Chicago · Cleveland · Dayton · Detroit · Elkhart · Matawan Milwaukee · New Haven · New York · Philadelphia · Pittsburgh · Springfield (Mass.) · Syracuse

Manufacturers of a complete line of electroplating and polishing equipment and supplies

...MBER, 1943—41st YR

NOV 20 1343 ©CIB 608486

Get this Booklet on ALUMINUM SPOT WELDING



This Booklet gives complete information on the use of CLEPO Tetra-Dip Process which provides:

1. Speedy treatment—maximum total 8 minutes.
2. Minimum labor due to short cycle.
3. Non-critical deoxidizing.
4. Minimum solution cost.
5. Maximum solution life.
6. Metal coating for safety in storage.
7. Increase in number of welding spots.

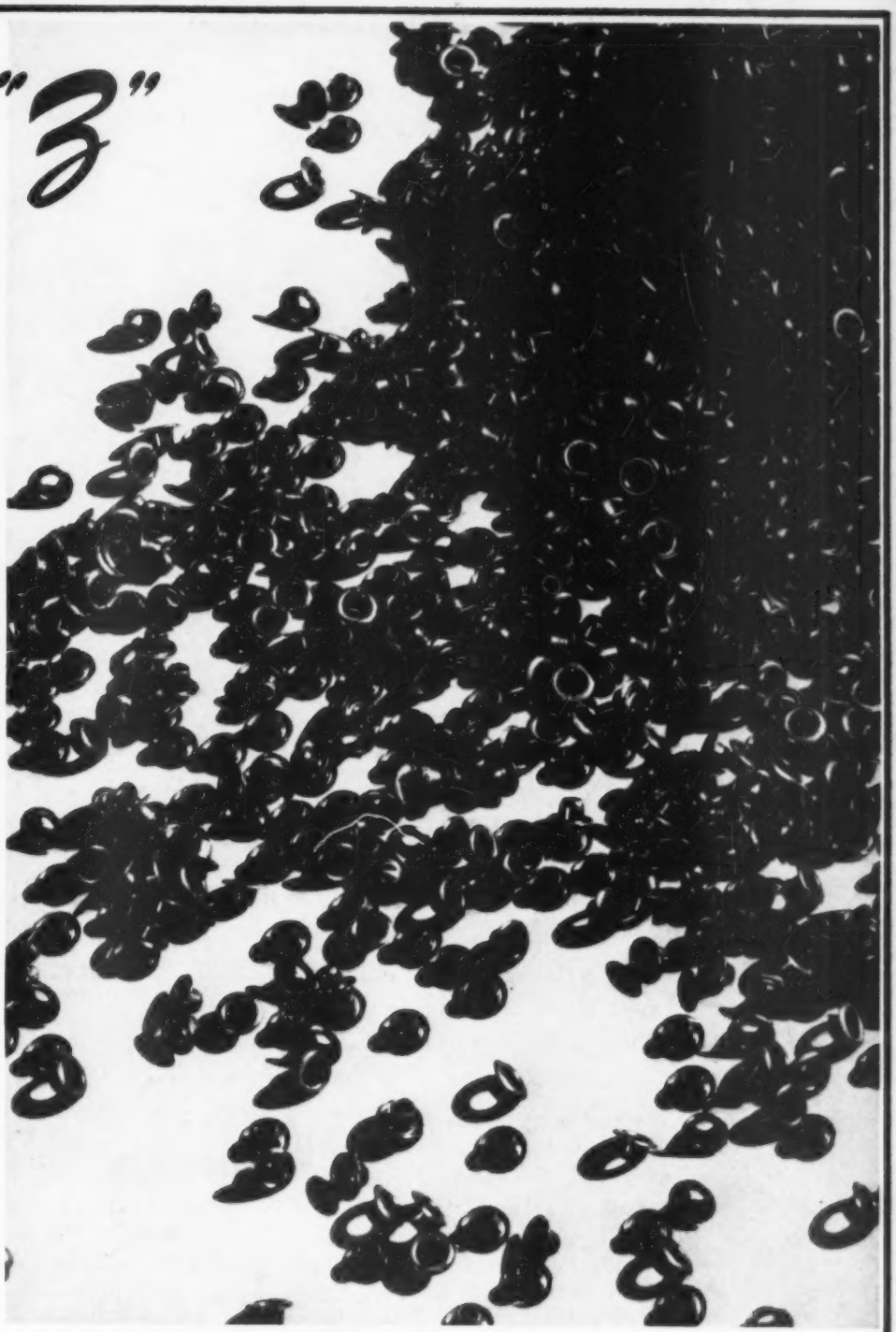
Consult your local Clepo Service Man.

FREDERICK GUMM Chemical Company

538 FOREST STREET, KEARNY, N. J.

Ebonol "Z"

has blackened millions of zinc eyelets and grommets



Blackening of Zinc is easy with Ebonol "Z". Tumbled about for 3 minutes in an 8 oz./gal. solution of Ebonol "Z" salts, zinc eyelets are given a beautiful adherent black coating of molybdenum sesquioxide.

Ebonol "Z" can be applied to sheet zinc, zinc alloys, hot-galvanized and electroplated zinc. It removes very little zinc (about 0.00002") and costs about ½c per square foot for materials.

Any metal can be blackened by zinc plating and blackening with Ebonol "Z"

Ebonol "Z" is an ideal method of preparing zinc surfaces for enameling and lacquering.

OTHER BLACKENING PROCESSES

Ebonol "S"—A one bath process for blackening steel and cast iron.

Ebonol "C"—A low temperature process for blackening copper and its alloys.

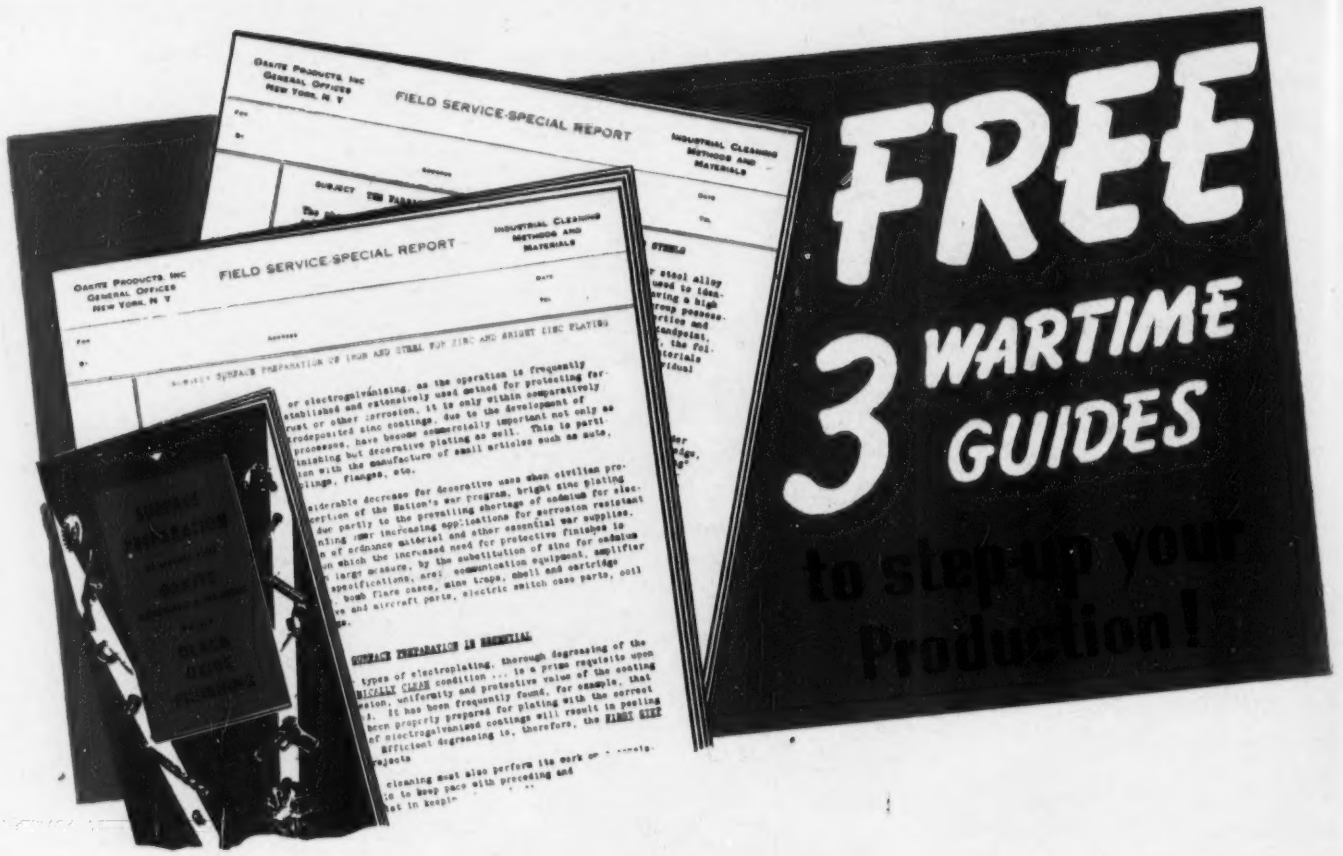
Ebonol "A"—A process for blackening aluminum and preparing it for plating.

Literature and technical data available on all processes.

ENTHONE

THE ENTHONE CO.

442 ELM STREET NEW HAVEN 2, CONNECTICUT



From first page to last, each of these THREE Oakite publications furnishes practical, useful technical data that can help STEP-UP your output of vital war supplies! Since the swiftly changing wartime scene constantly creates NEW production problems, you'll want to put this SPECIALIZED data to work for YOU!

Fabrication and Surface Treatment of Stainless Steels

In this Special 4-page Field Service Report, you will find valuable information on facilitating the fabrication of stainless steel. It tells how you can SPEED-UP machining, grinding, drawing, forming, pickling and descaling ...prepare surfaces for welding or annealing. Also gives data on removing soldering flux and cleaning parts before assembly or shipment.

Surface Preparation of Iron and Steel for Bright Zinc Plating

A timely 6-page report reviewing procedures for correct surface preparation of ferrous parts before application of bright zinc coatings. Describes still tank and cathodic cleaning as well as anodic degreasing...also presoaking techniques that aid in securing chemically clean surfaces. Contains helpful tips on removal of oxide, scale and rust.

Surface Preparation of Metals for Black Oxide Finishing

This 20-page manual is "must" reading for all executives responsible for black oxide finishing operations. Complete, concise, detailed, it explains how to obtain chemically clean surfaces that insure successful application of black oxide coatings. Gives specific directions and formulas. It is a helpful wartime guide for any plant now engaged in this work.

You are invited to write for any of these publications. Also, feel free to consult your nearby Oakite Technical Service Representative. Let him give you the benefit of his experience and knowledge on proper surface preparation before all finishing operations. Your inquiries invited, promptly answered.

OAKITE PRODUCTS, INC., 18 Thames St., NEW YORK 6, N. Y.

Technical Service Representatives in All Principal Cities of the United States and Canada

OAKITE CLEANING

MATERIALS...METHODS...SERVICE

FOR EVERY CLEANING REQUIREMENT

METAL FINISHING is Published monthly by The Metal Industry Publishing Company, 11 West 42nd Street, New York, N. Y., U S. A.
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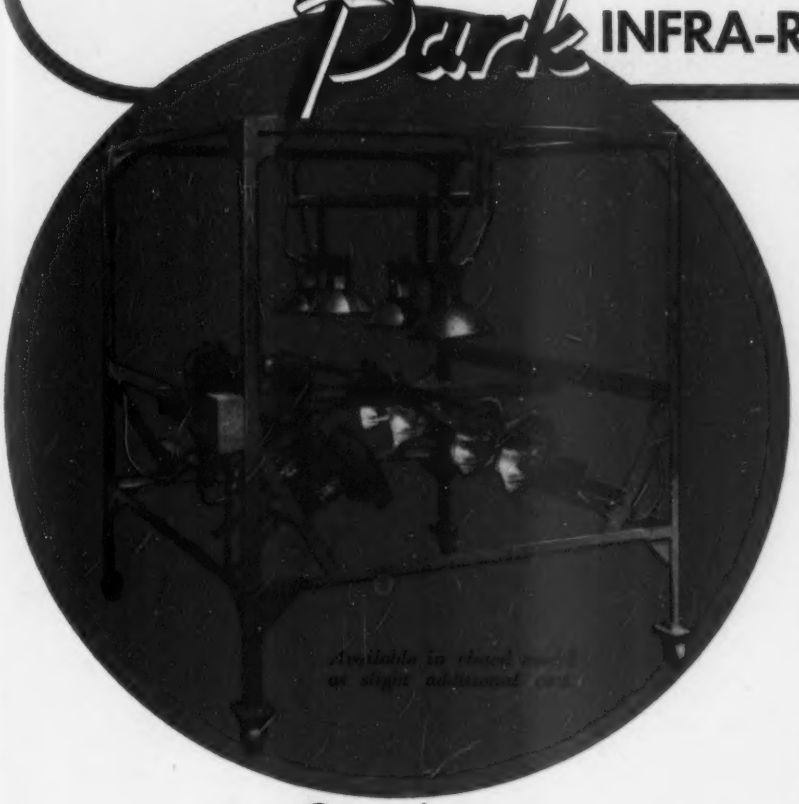
Volume 41, Number 11, November, 1943. Two Dollars Per Year.

CUT DOWN ON YOUR POLISHING WHEEL INVENTORY WITH THIS Park INFRA-RED DRYER



Features

1. Even drying assured.
2. Lamps are adjustable to any distance from the wheels.
3. Various diameter wheels can be mounted on the drying shaft by use of special bushings.
4. Unit furnished with 12 gold-plated reflector lamps—250 watts, 115 volts each.

Now you can use the same wheel more than once in a single day

Think of the savings you can realize now that it is possible to cut down on your wheel inventory! Yes, this newly improved Park Infra-Red Dryer (patented) dries polishing wheels in *minutes* instead of *hours*. Not only will you be able to save on your wheel inventory with a Park Dryer but you can also cut your production time in drying operations.

If you are interested in effecting definite savings in your polishing department merely write our sales department and a Park representative in your territory will (without obligation on your part) show you the advantages in using a Park Infra-Red Dryer on your job.

Delivery: Immediate delivery can be made on both the Infra-Red Dryer and Kold Grip grain cement with necessary priorities.

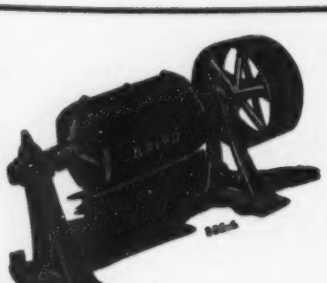
Park KOLD GRIP GRAIN CEMENT

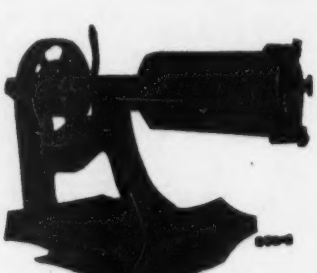
Park's Kold Grip grain cement is a highly efficient cold cement binder used to attach abrasive grains to the face of a polishing wheel or belt, and also to cement wheel sections together. Park Kold Grip grain cement can be used as a substitute for glue in setting up any size polishing wheel. It is clean, odorless and is not subject to bacterial attack. Available in 5 or 55 gallon drums.

Park
PARK CHEMICAL CO

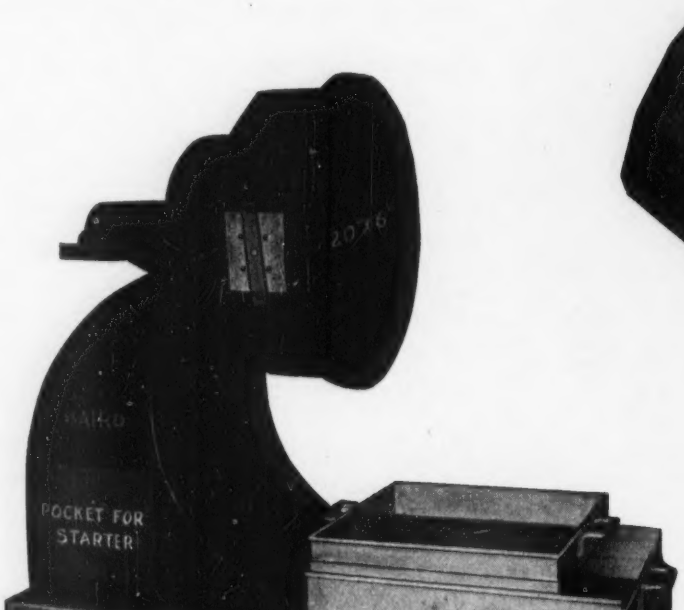
Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement

8086 MILITARY AVE. DETROIT, MICH.





HORIZONTAL BARRELS **TILTING BALL BURNISHING BARRELS**



This shows a High and Narrow Type of Barrel mounted on "Baird" Model D. or Pedestal Type Motor driven Oblique Tilting Tumbler.

As shown the barrel was lined for use for burnishing with hardened steel balls.

These barrels may be of any suitable material depending on the job. Cast iron or fabricated steel unlined or lined with rubber etc. for rolling in abrasives.

Made in 20" dia. x 6" for No. 1 Tumbler
Made in 24" dia. x 8" for No. 2 Tumbler

This shows the side of a No. 1 BAIRD Model D. Single Oblique Tilting Tumbler with a No. 22 Sheet Steel Polygonal Barrel and with an Automatic Electrical Tilting Device.

This device AFFORDS GREATEST SAFETY — LEAST LABOR — LEAST FLOOR SPACE—LEAST AMOUNT OF DISTANCE TO MOVE WORK in USING the tumbling barrels. SAVES TIME AND FLOOR SPACE.

When tumbling questions come up "ASK BAIRD ABOUT IT"

AUTOMATIC MACHINERY BAIRD STRATFORD CONNECTICUT, U.S.A.

THE BAIRD MACHINE COMPANY

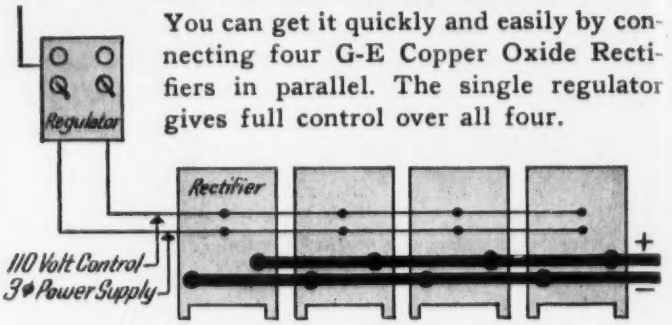
STRATFORD 9, CONNECTICUT

Since 1846 specializing in high production machinery for articles of wire and for ribbon metal. Also machines to turn, bore, etc., castings, forgings, etc., up to 10½" diameter.

"Ringing the Bell"
IN
HARD CHROME
Calls for D-2530 RACKOTE
STOP-OFF LACQUER
Engineered for Production. This tough flexible coating is continually "Ringing the Bell" in Hard Chrome Departments all over the country. On plating lines where the speed and ease of application, fast drying, perfect insulating on long immersions and easy stripping are absolute requisites D-2530 is in constant and proven use. Its selection by a number of the largest producers of airplanes, marine and aircraft engines, aircraft landing gears and other highly technical items is testimonial of D-2530's ability to render perfect service. Write for literature.
WHAM!
WYANDOTTE PAINT PRODUCTS CO.
RACKOTE DIVISION - WYANDOTTE, MICH.
TRIBUTORS AND WAREHOUSE STOCKS IN PRINCIPAL UNITED STATES AND CANADIAN CITIES
WYANDOTTE PAINT PRODUCTS CO.

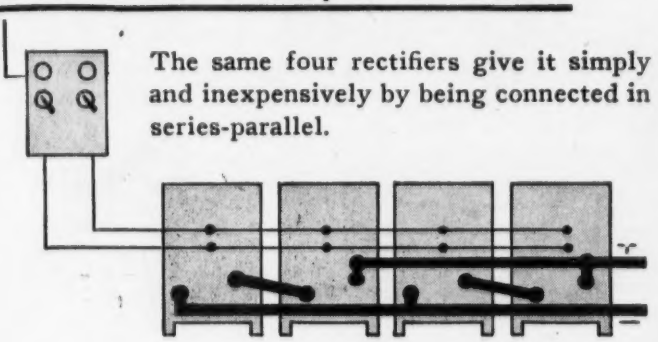
IF YOU NEED D-c POWER...

For TANK PLATING AT 2000 AMPS, 1-6 VOLTS



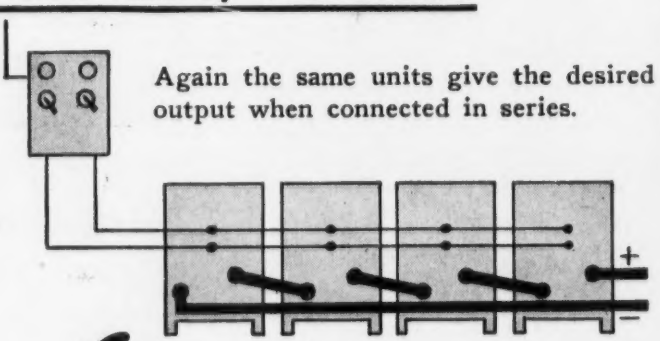
You can get it quickly and easily by connecting four G-E Copper Oxide Rectifiers in parallel. The single regulator gives full control over all four.

For BARREL PLATING AT 1000 AMPS, 2-12 VOLTS



The same four rectifiers give it simply and inexpensively by being connected in series-parallel.

For ANODIZING AT 500 AMPS, 4-24 VOLTS



Again the same units give the desired output when connected in series.

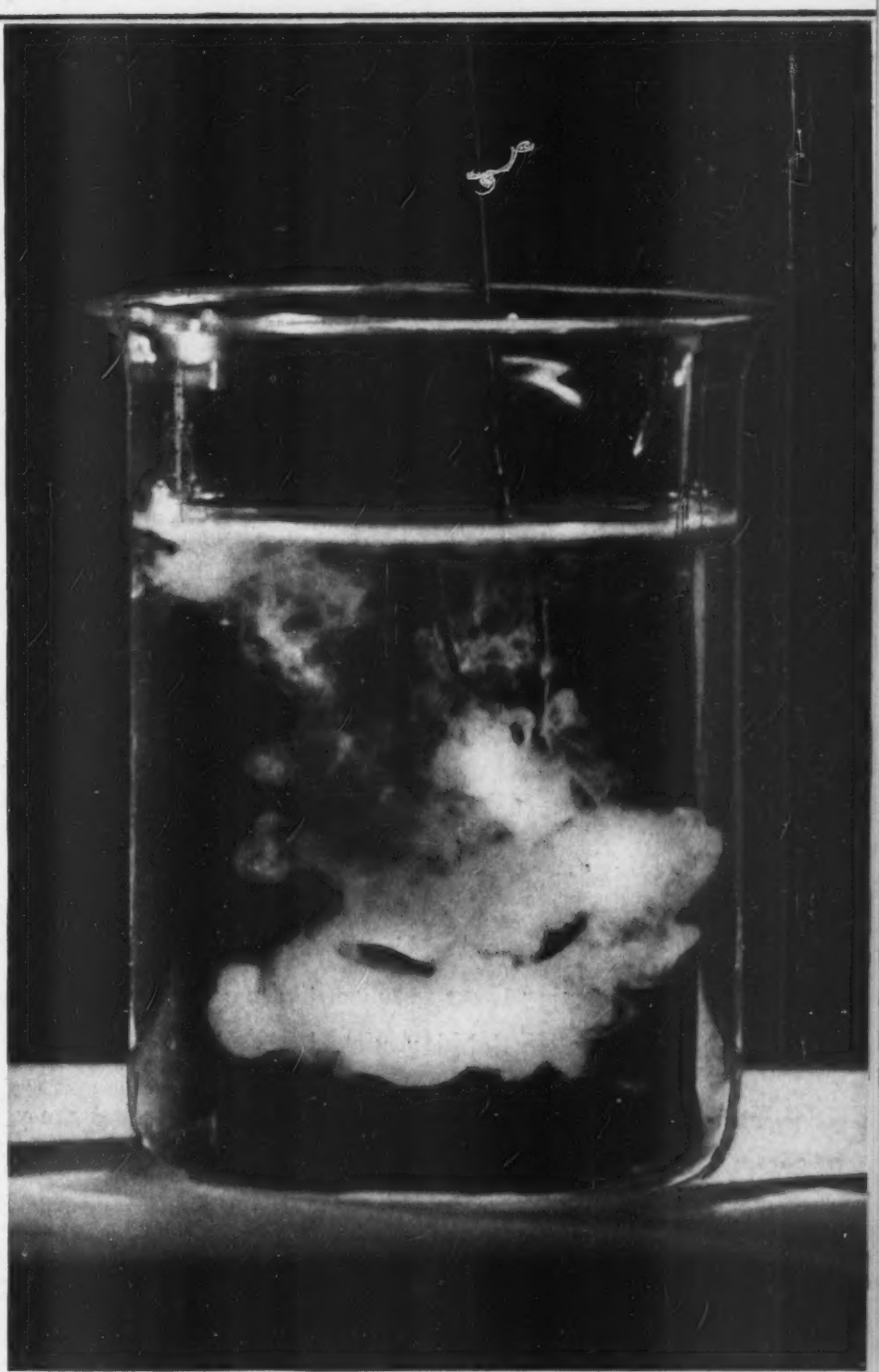
OR FOR a great variety of other jobs, G-E rectifiers can be used with maximum efficiency. Output can always be increased or decreased. Further, they involve virtually no maintenance costs. Why not investigate the potential advantages of G-E Copper Oxide Rectifiers in your electroplating? Just write to Section A1134-75, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

Enthone Emulsion Cleaner At Work

• Enthone Emulsion Cleaner is for *tough* cleaning problems . . . where you want to clean solid dirt and heavy oil films rapidly. It enables *complete* cleaning . . . the removal of both solid dirt and organic dirt. It means faster, cheaper cleaning. You have a way of preparing work for plating to insure adherent deposits — to make brighter deposits — to make less porous deposits. You can clean active metals such as zinc, aluminum and lead without etching or staining.

• If you have a difficult cleaning problem, let us help you. Tell us your problem. The advice and technical developments of the Enthone technical staff are yours for the asking.



This photograph shows the rapid, complete dispersive action of Enthone Emulsion Cleaner. Notice that the oil and grease blended with the emulsifiable solvent are being finely dispersed — there is no clotting or jelling.

ENTHONE

THE ENTHONE CO.

442 ELM STREET NEW HAVEN 2, CONNECTICUT

WE LOST A CUSTOMER

THIS manufacturer had used Du-Lite for several years with excellent results. Regular production was maintained in the finishing department and the finishing cost was low. Whenever he had a new job requiring a little different procedure, an experienced Du-Lite representative was available to make recommendations so that production could continue without interruption.

Then he decided to change to another product, not because he expected a better finish but because this other material cost less per pound. They made the change and the trouble started.

An urgent 'phone call was our first information that the manufacturer had made a change and was in trouble. Then he told us the story. He could not make the new material work satisfactorily. Production had been held up for more than a week. He had tried to get help from the supplier—no luck. Worried and disgusted, he called on Du-Lite.

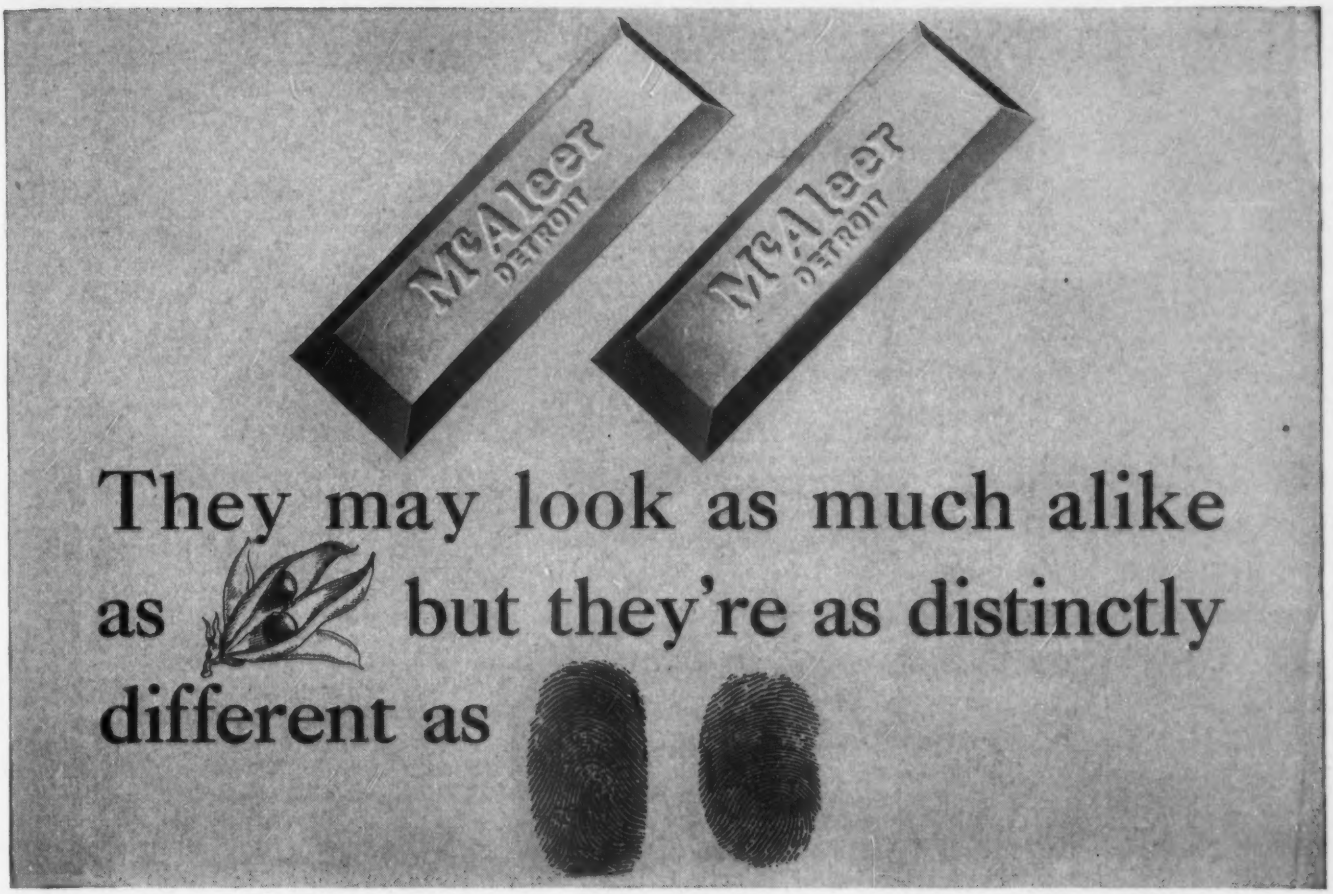
Du-Lite salts were delivered within two hours and a Du-Lite representative was on hand to get things going. The processing tanks were emptied and cleaned. New solutions were made up with Du-Lite and regular production finishing started. We have our old customer back—for keeps.

Sure, you can buy oxidizing salts for less than Du-Lite but are you sure you will really save money? Will you get the same production? Will the finish be as satisfactory? Can you afford to take the risk?

Du-Lite is more than a chemical process. It is the "Know-How" gained by research and experience as specialists in steel finishing. You are invited to take advantage of this "Know-How" in connection with your individual problems.

Why not write, wire or telephone today? An experienced representative will call promptly and make recommendations to solve your problem.

DU-LITE CHEMICAL CORP.
MIDDLETOWN, CONNECTICUT



WHEN we want to express similarity of things, we sometimes say "alike as two peas in a pod" . . . an apt comparison if we disregard what peas are for. When we eat them, they don't all *taste* alike . . . That's the way it is with BUFFING and POLISHING compositions.

There was a time when any "all-purpose" composition was acceptable in most instances for the general run of finishing work. War production finishing demands changed all that. Today the former user of "all-purpose" materials has come to realize that you can't specify the things that make a product really superior. Skill, knowledge, facilities and an honest desire to do a good job can't be standardized . . . McAleer finishing materials, whether used for polishing or buffing aluminum, brass, steel, copper, nickel, chrome and other metals, or for removing small flash or fins, file marks, blow holes, tool or die marks from plastics, are as distinctively different in their job-fitted characteristics as two thumb prints.

They are made to do an exacting job, do it well and keep on doing it as long as need for the specific type of material exists. Standards protect the manufacturer on those materials which must be buffed or polished; but when your compositions bear the McAleer trade mark, you get more than standards—you are protected all the way.

The nature of our business requires McAleer Finishing Engineers in the field to be virtually *"Jacks of all trades"*. And, contrary to the old adage, they are *masters* of many. Individually these men are specialists. As a body their specialty is *versatility*. This extra *"know-how"* possessed by McAleer Field Engineers backed by the second-to-none laboratory and manufacturing facilities are dedicated to but one purpose . . . helping you solve your individual finishing problems, whether those problems involve the finishing of metals or plastics . . . or both. Whichever it is, let us demonstrate McAleer service on your meanest finishing problem.

McAleer MANUFACTURING CO.

Manufacturers of Quality Controlled Finishing Materials

ROCHESTER, MICHIGAN

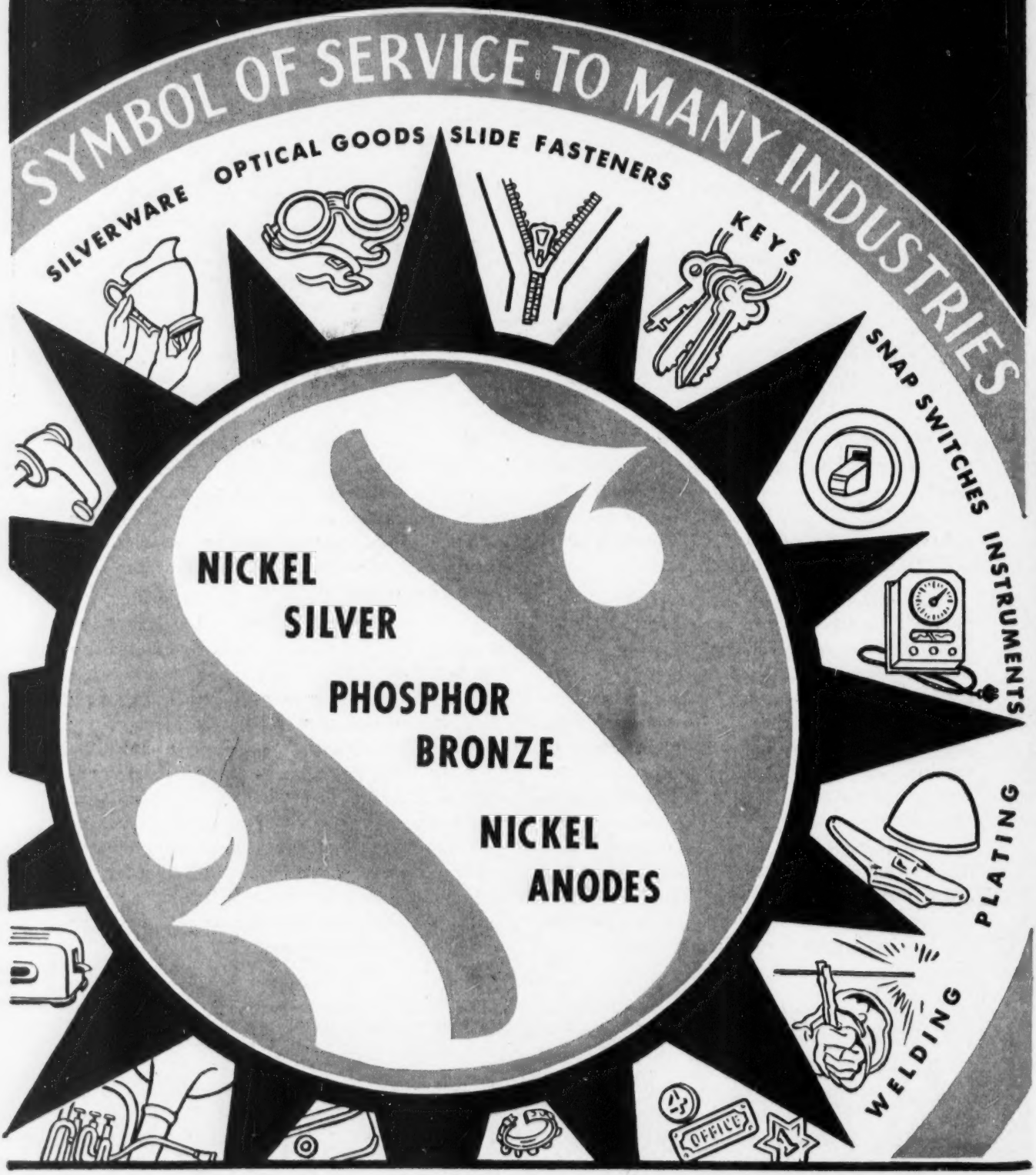
THE SEYMOUR MANUFACTURING CO.

SEYMOUR, CONNECTICUT

Nonferrous Alloys Since 1878

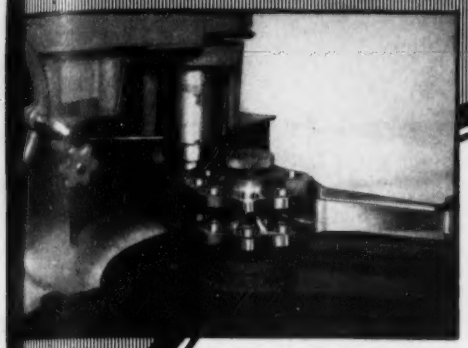
In the 65 years that "Seymour" has been making nonferrous alloys, service has spread to every metal working industry. In this period, three wars have drawn heavily upon, and materially developed the uses for, "Seymour" products. In the present war, knowledge of these products is being gained that should have a far-reaching postwar value; for no previous war or peace has exacted the ingenuity that is fast becoming plant routine!

Peace *will* come — and with it need for large scale rehabilitation . . . . in which "Seymour" looks forward to enthusiastic participation.



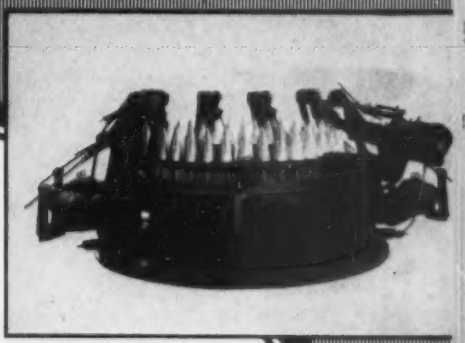
Solving the Man-Power Shortage

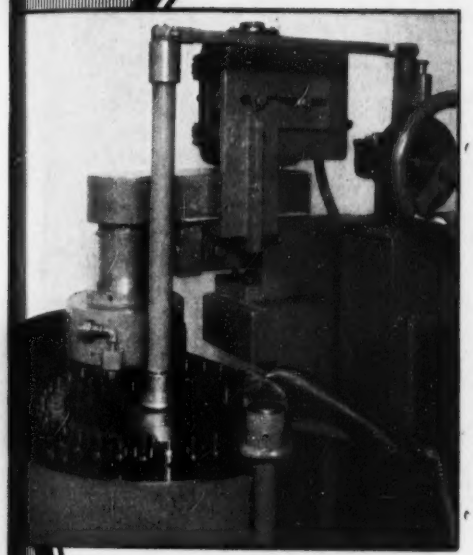
in POLISHING..BUFFING..
WIRE BRUSHING..BURRING



Special Acme Machine for polishing engine parts.

Special Acme Machine with 8 belt heads — for polishing tapered cylindrical parts. Multiplies daily production, with greatly reduced man-power.



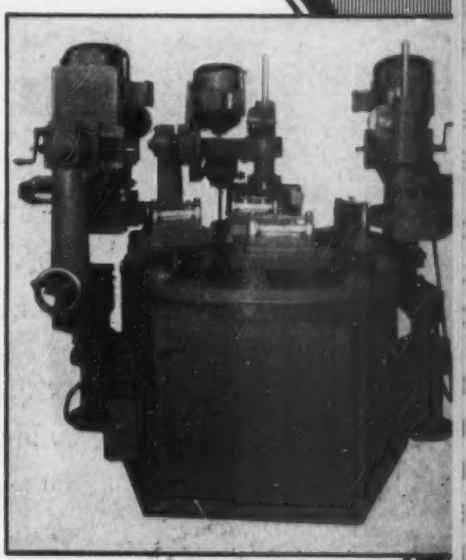


Keep Production Up

BY USING

ACME AUTOMATICS

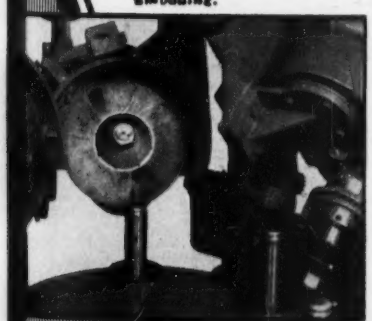
And Spreading Your Man-Power!



Special Acme Machine for grinding small mechanical parts—2000 per hour. Automatic wheel feed. Automatic diamond dresser. Automatic unloading.

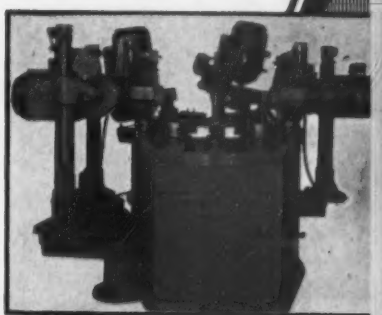
Special Acme Machine for blending the radius in washers—1200 to 1500 operations per hour.

Special Acme Machine for polishing and oiling aircraft parts.



Acme Rotary Machine for polishing, buffing and wire-brushing. Big savings in man hours.

Special Acme Machine for finishing pistons. Constructed to finish valve recess and avoid stuff marks.



ACME *Manufacturing Co.*

1642 HOWARD ST. • DETROIT, MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 25 YEARS

YOU'RE ON THE RIGHT TRACK WHEN YOU SPECIFY

★

HARSHAW

ANODES *and* CHEMICALS

IT is the dogged perseverance of continuously keeping on the trail of new techniques and new processes for up-to-the-minute plating methods that has earned a sound reputation for Harshaw Anodes and Chemicals.

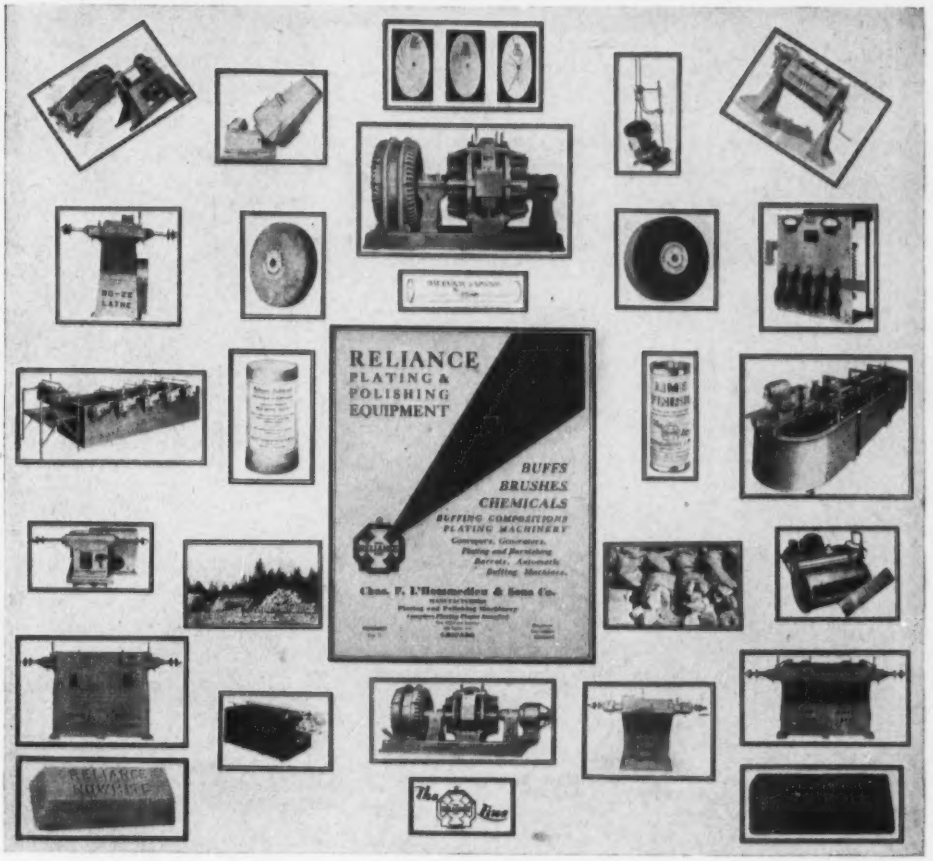
Wherever you find reliable plating performance, there you find Harshaw Anodes and Chemicals. Their dependable plating action reflects many years . . . over fifty years . . . of continuous testing and research.

The sudden problems of wartime plating have of necessity uncovered new plating techniques. Many of these will radically change old-time plating methods in the post-war industrial era. You may rely on Harshaw to supply you with the usual high quality Anodes and Chemicals.

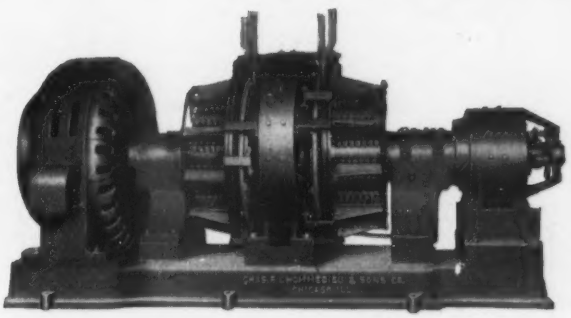
This lead plating booklet furnishes you with practical plating information which you can use. We will gladly send you this free book. Write for it . . . now.

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

QUALITY PRODUCTS



EVERYTHING FOR PLATING AND POLISHING



ANODIZING GENERATORS

Chas. F. L'Hommedieu & Sons Co.

Manufacturers of

PLATING AND POLISHING MACHINERY

Complete Plating Plants Installed

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W. R. Shields
Detroit, Mich.

C. B. Little
Newark, N. J.

O. M. Shoe
Philadelphia, Pa.

Branches:
Cleveland and Los Angeles

EVERYTHING IN EQUIPMENT AND SUPPLIES FOR PLATING AND POLISHING

CHINESE CERAMICS
In the field of Ceramics the Chinese rank among the few master potters of all time. The Potter's art, practiced as far back as the time of Shun (2317-2208 B.C.), was considered a sacred and noble calling—so noble in fact that even Emperors themselves sometimes made articles with their own hands. The pottery itself was also considered sacred and samples were kept in a holy place in the Hall of Sacrifices.

Masterpieces OF POTTERY

IN THE HANDLING of heavy chemicals and corrosive liquids, General Ceramics Chemical Stoneware has many outstanding features. It is acid-proof throughout to protect property and employees from the dangers arising out of hazardous leakage. Its strength and durability make General Ceramics Chemical Stoneware long-lasting, regardless of hard use, rough handling and the ravages of time. It is manufactured under the most careful supervision and tested with rigid thoroughness. Its hard, glazed surface will not stain and is easy to keep clean, thus assuring product purity.

Among the wide variety of Chemical Stoneware products manufactured by General Ceramics are acid-proof faucets, valves, pipe, fittings, kettles, jars, tanks, pots, pumps, exhausters, coolers, condensers, acid elevators, towers, filtering equipment and tourills.

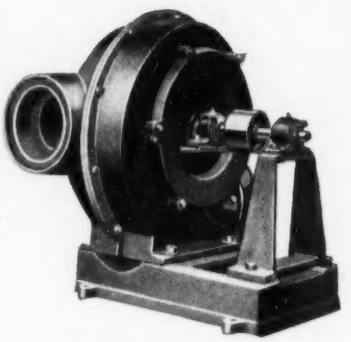


FIG. 100
EXHAUSTER ON BASE

Other products include steatite insulators made by General Ceramics & Steatite Corp., Keasbey, N. J.

General Ceramics Co.

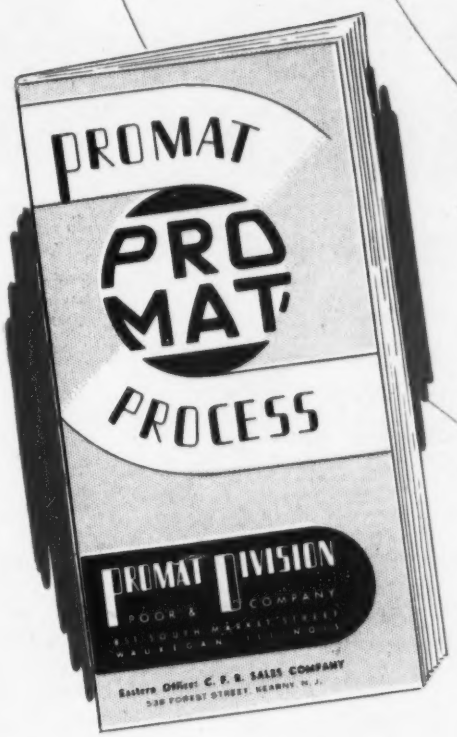
GENERAL CERAMICS COMPANY
CHEMICAL STONEWARE

CHEMICAL STONEWARE DIV.
KEASBEY • NEW JERSEY

3953

Get all the FACTS about PROMAT

An absolutely New and Different Method of Electro-plating



Promat makes possible better electro-plating—superlative standards of quality and performance, exceeding the possibilities of conventional plating.

Promat offers YOU the employment of new chemical principles and newly developed CHEMICAL COMPOUNDS.

Promat offers electrical equipment for producing superimposed alternating current which can be used advantageously with the new compounds, creating better anode characteristics and greater cathode efficiency.

Your present electrolytes can be converted to Promat electrolytes at little expense.

Promat electrolytes offer advantages over conventional plating baths when used with direct current. The new chemical principles employed provide extremely lustrous, fine-grained deposits, wide operating ranges and good efficiency characteristics.

Promat meets the exacting specification plating required by the armed services. In fact, Promat was evolved, after years of intensive research and field testing, by the impetus of war demands, the urgent need for higher standards of quality and faster production.

The Promat Process is now being used in many large plants thruout America. Hundreds of thousands of gallons of Promat solution are daily giving highly satisfactory service.

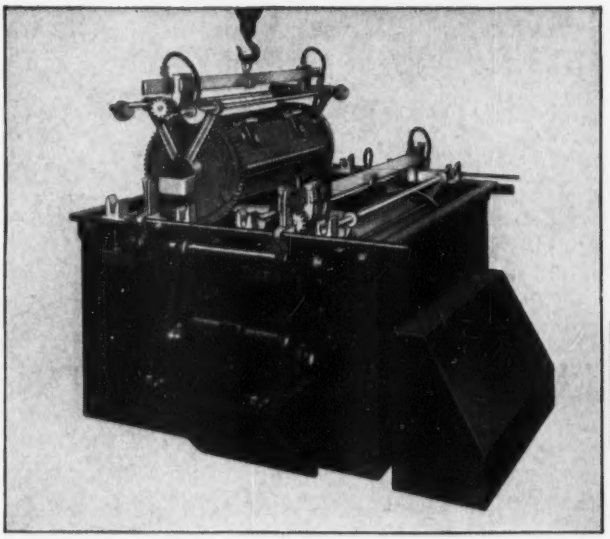
Write for your copy of this 12 page illustrated technical booklet just off the press describing in detail the Promat Process of electro-plating.

Our Laboratories will gladly process samples of your product for your inspection and tests.

The PROMAT DIVISION, Poor & Company

851 S. Market Street, Waukegan, Illinois

EASTERN OFFICE: C. F. R. SALES CO. 538 FOREST STREET, KEARNY, N. J.



Twin Unit
Barrel Plater

For Faster, More Uniform Plating and Lower Maintenance Costs—

Specify LASALCO

Multiple Unit Barrel Platers

★ The Lasalco Platers are designed to give a maximum of production with a minimum of labor — and that's important today when every hour gained will shorten the war. Lasalco Multiple Plating Units can increase the amount of production per man-hour.

Because these machines are ruggedly and carefully built under rigid specifications, they will stand up under today's 3-shift production with practically no time out for maintenance.

Get complete information on these platers and other Lasalco plating and finishing room equipment and supplies by calling in a Lasalco Engineer.

LASALCO, INC.

2818-38 LaSalle Street
St. Louis, Missouri

Our laboratory and engineering staff will gladly work with you on any problem involving the finishing of

Plastics

1. *Producing the highest possible finish on plastic parts.*
2. *Refinishing surfaces damaged in fabricating processes.*
3. *Removing fins from finished parts.*

PLASTICUT—Primarily a fast cutting and buffing compound for finishing rough surfaces and removing fins. Contains sufficient lubrication to prevent overheating.

PLASTICOLOR—Very light cutting action. Used principally to bring up clean, bright finish.

No. 16 BLACK COMPOSITION—Particularly adaptable for dark colored articles. For buffing and removing fins and to bring up good finish.

No. 181 WHITE COMPOSITION—An extra dry composition for final wiping or cleaning operation.

TRIPOLI REGULAR No. 1—For use on hard, tough products such as bakelite, etc., to buff surface and remove fins.

No. 20 BUFFING COMPOSITION—A white composition with fast cutting properties for use on extra tough products.

Select the grade best suited to your particular job and write us for working sample. See for yourself how these Stevens Compositions will bring up the finish on plastics.

●

Manufacturers for over forty years of all types of buffing compositions for metal parts.

FREDERIC B. STEVENS INCORPORATED

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- NEW ENGLAND — 166-182 Brewery St., New Haven, Conn.
- NEW YORK and PENNSYLVANIA — 93 Stone St., Buffalo, N. Y.
- INDIANA — Hoosier Supply Co., 36 S. Cruse St., Indianapolis, Ind.
- CANADA — FREDERIC B. STEVENS OF CANADA, LIMITED
  - 1262 McDougall St. — Windsor, Ontario
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BUFFING COMPOSITIONS • METAL POLISHERS AND ELECTROPLATERS SUPPLIES-EQUIPMENT

WAR PRODUCTION SILVER PLATING

confirms the advantages of . . .

HANDY & HARMAN 999 "PLUS" FINE SILVER ANODES

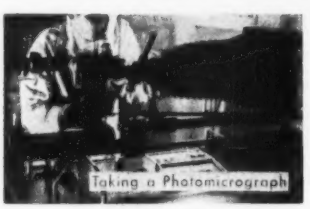
That these 999 "Plus" Fine Anodes assure *uninterrupted production of uniformly excellent plating results* has long been known by their many regular users throughout the Arts and in Industry. Now, their extended use on war production plating has supplied further convincing evidence.

For example, they are now used for silver coating airplane engine bearings and successfully meet all requirements of this unusually severe service. You could not ask for more exacting proof of silver plating quality than this.

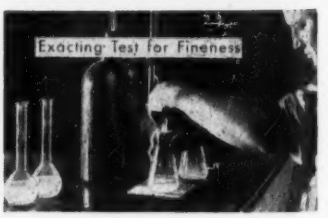
Equal success is being obtained with 999 "Plus" Fine Anodes on other war production plating jobs, including many that were formerly done with copper, nickel, chromium and cadmium.

It's what is back of the 999 "Plus" Fine stamped on every Handy & Harman Anode, that assures you of trouble-free production and best results on any silver plating you have to do. Try them, next time you need Silver Anodes.

— AND HERE'S WHAT 999 "PLUS" FINE MEANS


Taking a Photomicrograph

Making a Spectrographic Analysis


Exacting Test for Fineness

(1) Silver fineness far above the standard for ordinary commercial silver. (2) Physical properties that years of research have established as best for plating. (3) Freedom from every trace of impurities that can cause plating troubles. Constant run-of-production tests guarantee the meeting of those standards in every bit of silver that goes into 999 "Plus" Fine Anodes.

ARMY E NAVY

HANDY & HARMAN

HANDY & HARMAN FOUNDED 1867 QUALITY SERVICE

82 FULTON ST., NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities

QUESTION:

WHY DOES PAINT CHIP AND PEEL FROM "HOT" GALVANIZING?

ANSWER:

Galvanized and Zinc-plated surfaces require paint for lasting protection, since in most instances the protective value of galvanizing or zinc-plating is not sufficient to insure preservation.

Paint will not adhere to "hot" or untreated zinc-coated or galvanized materials because of surface characteristics and alkalinity. Without proper "cooling" and preparation for paint, chipping and peeling result, thus destroying the whole purpose of painting—metal protection.

TURCO REDI-PAINT

TURCO REDI-PAINT passivates these surfaces. It effects the necessary chemical change by neutralizing alkalinity, roughening surface slightly for an anchor point for paint, making the metal resistant to corrosion, forming an inert film which will not become alkaline.

TURCO REDI-PAINT

TURCO REDI-PAINT speeds production by its easy application, by hand or by tank immersion. It eliminates unnecessary backtracking because of its easily distinguishable dark color, while rapid drying permits quicker handling for further processing.

★

Call the Turco Technical Service Man in your vicinity or fill in the blank below for further information regarding TURCO REDI-PAINT.

TURCO
PRODUCTS, INC.

SPECIALIZED INDUSTRIAL CHEMICAL COMPOUNDS

MAIN OFFICE & FACTORY: 6135 SO. CENTRAL AVE., LOS ANGELES 1,
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SERVICE MEN AND WAREHOUSE STOCKS IN ALL PRINCIPAL CITIES

BUY WAR BONDS

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6135 SO. CENTRAL, LOS ANGELES 1

Please send free booklet on REDI-PAINT

*Name*_____ *Firm*_____

*Title*_____

*Address*_____

ON YOUR LETTERHEAD, PLEASE

Don't Stop HALF-WAY

. . . *do the WHOLE JOB!*

Careful cleaning of work to be plated is only half the cleaning job—the solution in which the plating is done must be clean, too. Otherwise, impurities in the bath get on the plating surface, and the net result is the same as if the cleaning of the work had not been done completely.

Keeping the solution constantly clean is a simple matter—with DARCO S-51. For regular use of DARCO in the bath assures the *continuous* removal of harmful impurities.

DARCO S-51, an activated carbon, adsorbs grease, oil, soap, colloid molecules, decomposition products—even "invisible" impurities—then removes them from the solution completely with each filtration.

Do the whole job right! Use DARCO S-51. Get it at your dealer's—or write for a sample.

The article "Physical Removal of Impurities from Plating Solutions" discusses continuous filtration in detail. Write for a copy.

DARCO—Reg. U. S. Pat. Off.

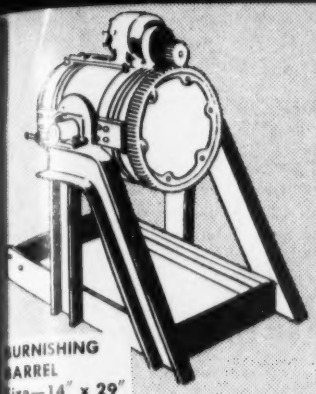
DARCO

This trade-mark identifies the genuine. Accept no packages without it.

DARCO

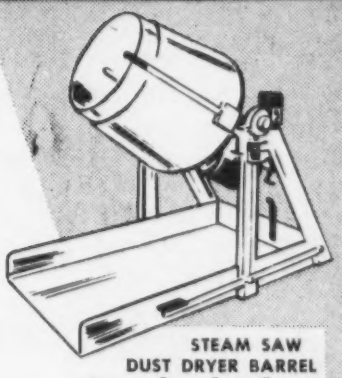
CORPORATION

60 East 42nd Street, New York 17, N. Y.



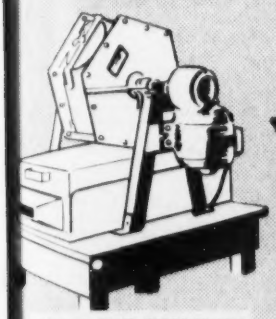
URNISHING
ARREL
ize—14" x 29"

DEBURRING
BARREL
Sizes—10" x 29"
and 9" x 20"



STEAM SAW
DUST DRYER BARREL
Size—21" x 24" x 24" deep

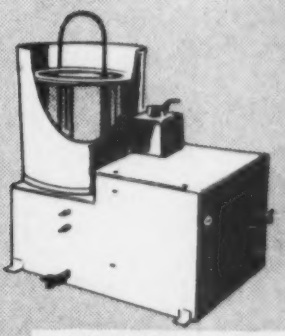
SAW DUST SHAKER
AND SEPARATOR



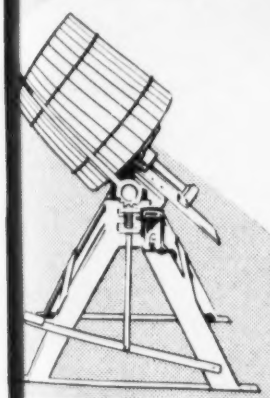
SMALL LOT BURNISHER
(Table Model)
Sizes—6" x 10½" and
8 x 10½"

SMALL LOT DEBURRING
MACHINE (Table Model)
Sizes—Same as above.

BELKE
BARRELS FOR ALL PURPOSES

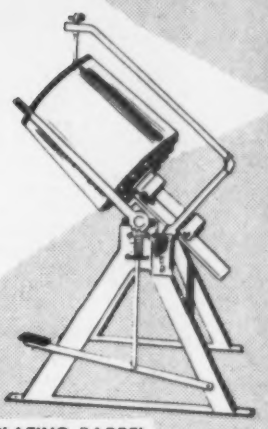


CENTRIFUGAL DRYER
Sizes—10" x 10" & 12" x 12"

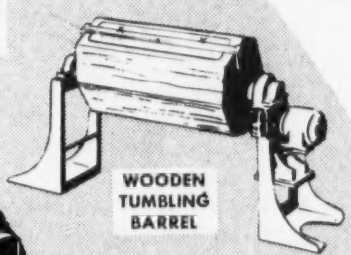


IQUE TUMBLING
OOD BARREL
—20" x 23" x 21"

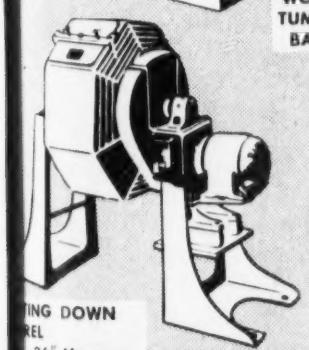
Don't do your work by hand. Due to the present labor shortage, labor saving devices are of prime importance. Use Belke Barrels for finishing . . . . They're FASTER, MORE ECONOMICAL, and assure more uniform work at lower unit cost. Belke also manufactures large multiple installations. For detailed information and literature write today.



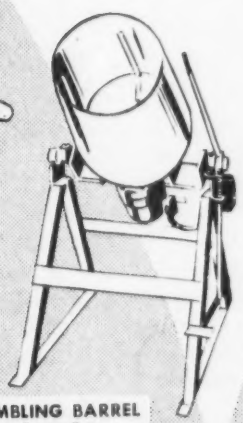
OBLIQUE PLATING BARREL
Size—20" x 23" x 21" deep



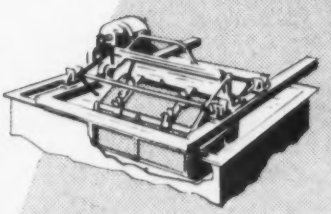
WOODEN
TUMBLING
BARREL



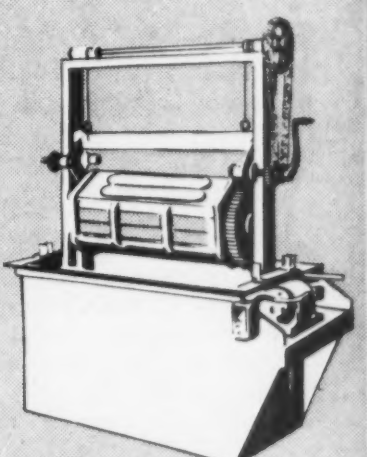
TING DOWN
EL
-36" Hexagon



OBLIQUE TUMBLING BARREL
Size—20" x 23" x 21" Deep



SMALL LOT PLATING BARREL
Sizes 10" x 18" & 12" x 24"



HORIZONTAL PLATING BARRELS
Single or Multiple Units
All Sizes.

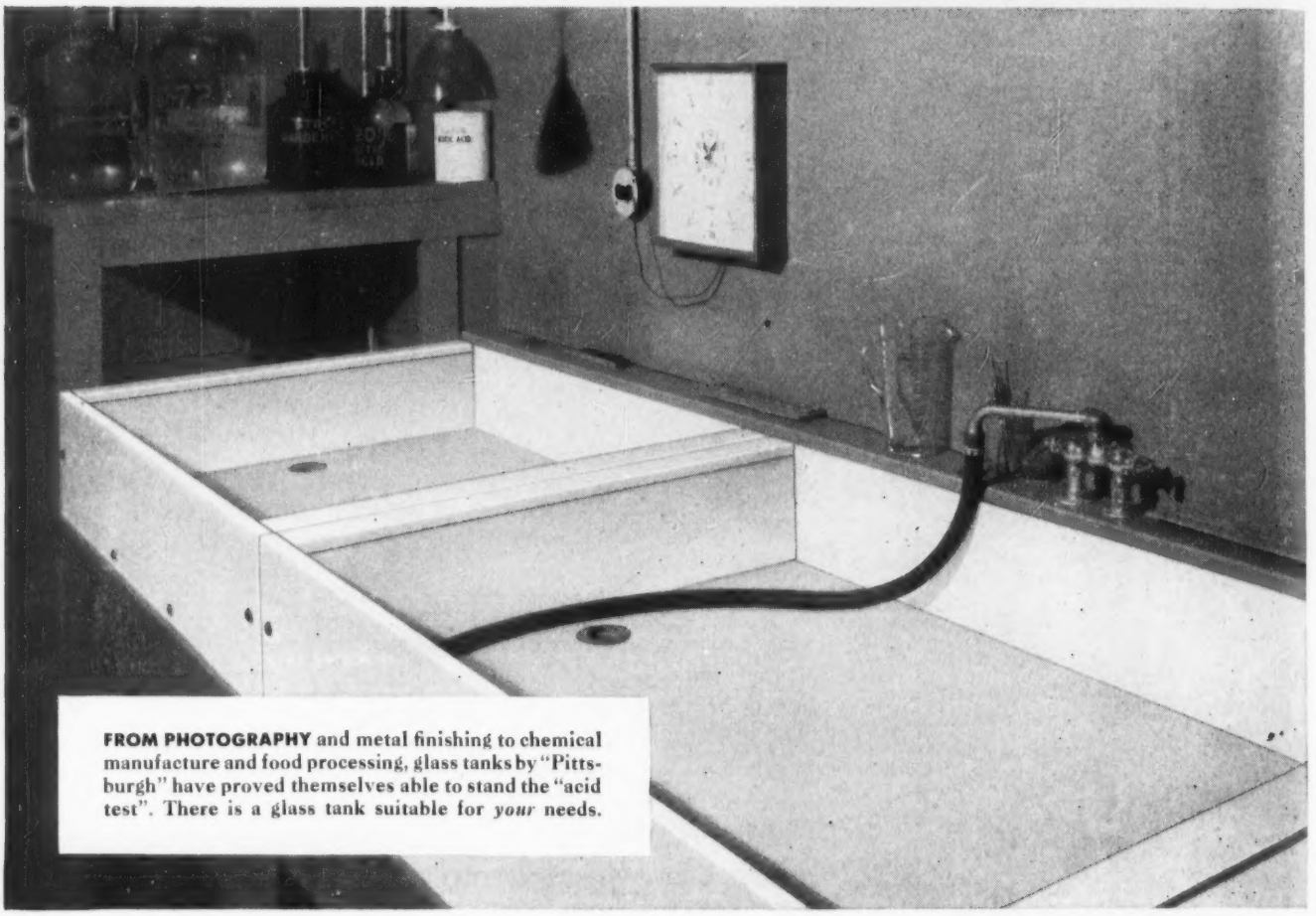
BELKE BETTER METHODS
TRADE MARK

"Everything for the Plating & Polishing Plant"

BELKE MANUFACTURING COMPANY
947 N. CICERO AVE., CHICAGO, ILL.

Tanks of Glass

ARE TANKS THAT *LAST*



FROM PHOTOGRAPHY and metal finishing to chemical manufacture and food processing, glass tanks by "Pittsburgh" have proved themselves able to stand the "acid test". There is a glass tank suitable for *your* needs.

● There are good, substantial reasons why the new glass tanks by "Pittsburgh" are creating such a sensation in every industry where they have so far been introduced.

First: glass tanks are non-porous, non-absorptive. They're unaffected by the chemicals, acids, alkalis and liquids which usually cause deterioration of tank linings. Whether you're processing steel or storing molasses, glass tanks don't get "stomach trouble."

Second: these tanks are made of *tempered* glass. The tempering process gives the glass the necessary strength and sturdiness to assure long and efficient service, despite hard usage.

Third: glass tanks are now available in a variety of types and sizes to suit almost any tank requirements. You can get Pittsburgh Glass tanks with inside facing of glass and outside shell of wood. You can get them faced with glass both inside and out. You can get them made of transparent glass for certain specialized service. Or you can have a crew of Pittsburgh workmen come into your plant and line your *present* tanks with glass.

Fourth: glass is not subject to the priority limitations now placed on many other tank materials. You can get glass tanks promptly.

Write us today, explaining your requirements. We will gladly work with you on the application of glass tanks to your own needs. Pittsburgh Plate Glass Company, 2104-3 Grant Building, Pittsburgh, Pa.

PITTSBURGH PLATE GLASS COMPANY

"PITTSBURGH" stands for Quality Glass and Paint

They also Serve

WHO FIGHT THIS WAR AT HOME

★ Frankly, we at Udylite have been too busy fighting this fight for Victory in our own remote way to do much bragging about it.

Udylite's products and services are practically unknown to the man on the street, the housewife or our boys and girls in the service.

In spite of this obscurity there are few pieces of fighting equipment today where metal finishing and corrosion resistance are necessary that have not benefited by the efforts of Udylite's army of employees —the years of intensive research for better methods and the high standard of dependability for which Udylite is known.

Udylite's men and women are part of this fight. The fruits of their labors are of vital importance to the fighting equipment of every branch of the service. Their knowledge and efforts have helped give our boys better fighting tools than the enemy.

To those of our customers who have so graciously "taken second" to vital government requirements on our services we extend our sincere thanks and the hope that we may soon again render them typical Udylite service.

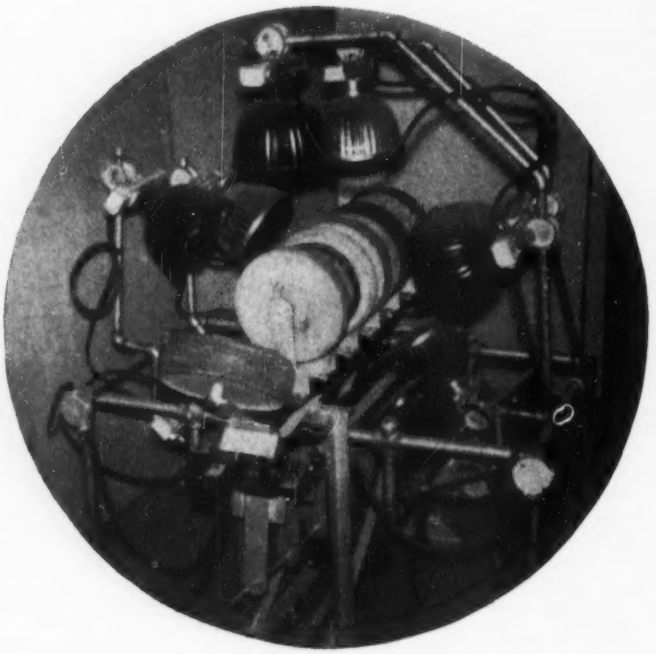
L. K. Lindahl

PRESIDENT

THE UDYLITE CORPORATION

1651 East Grand Blvd., Detroit, Mich.

★ **OUR BOND QUOTA IS OVERSUBSCRIBED—IS YOURS?** ★



THIS INFRA-RED LAMP POLISHING WHEEL DRYING MACHINE

Will speed up production as the set up wheels are returned to the polisher in 20 minutes. Room temperature drying requires 10 hours per wheel.

Wheels made with NUGLU will not split or ridge under excessive heat.

J. J. SIEFEN CO.
DETROIT

YOUR METAL-WORKERS

CAN KEEP SKIN FREE FROM IRRITATION

WITH

M·S·A

FEND

INDUSTRIAL CREAMS AND LOTIONS

Protect your workers against skin irritation, rash and soreness with FEND. Six different FEND Creams and Lotions provide *safe, positive, proved protection* against many-score skin affections. Easy to apply and remove.

Write for descriptive Bulletin FA-79.

MINE SAFETY APPLIANCES COMPANY
Braddock, Thomas and Meade Streets
Pittsburgh, Pa.

"Call Du Pont Quick! We need help on Zinc Plating!"

TURNING TO ZINC? Many platers are. Various government agencies have specified a change from cadmium to zinc on many products because, at present, there is not enough cadmium to meet all demands. Have to meet the new emergency specifications? Call on Du Pont! There's a Du Pont zinc plating process—together with the proper chemicals—to do the job for you, no matter what your requirements.

You can install a Du Pont zinc plating solution quickly, easily... use it in standard plating equipment. Du Pont plating procedures have been simplified so much that any experienced plater can easily get either dull or bright zinc plate on a wide variety of work. And, with the *right* process and the *right* chemicals, you can get consistently top-notch results!

And remember. When you call Du Pont, you're calling upon a group of highly specialized technical men, ready to help you with the knowledge gained from many years' electroplating experience. They will help you choose the process and materials best suited to your requirements. And they'll be ready to offer specific advice on installation and operation of zinc plating processes. Don't wait! Call on Du Pont *today!* Write, wire or telephone: E. I. Du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington, Delaware.

CONSERVE FOR VICTORY—
USE PLATING MATERIALS WISELY!

DU PONT
REG. U. S. PAT. OFF.

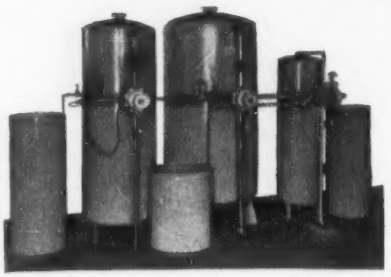
DU PONT ELECTROPLATING

Chemicals • Processes • Service

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Pure WATER FOR PLATING

at a fraction of former costs!



ILLCO-WAY DE-IONIZED WATER REPLACES DISTILLED WATER

Typical ILLCO-WAY unit shown above: installation in a prominent industrial plant; 1,700 gallons per hour. Other installed units have permissible flow rates of from 10 to 50,000 gallons per hour . . . . Modern, economical method is based on ion-exchange, using Amberlite resins . . . . Learn how ILLCO-WAY equipment can speed production, help cut costs in *your* plant.

De-ionized water (comparable to distilled water, but at a fraction of its cost) in plating solutions and in rinse tanks eliminates the troubles due to mineral salts in water supply. Ion-exchange resins can also be used to reclaim precious metals now being washed away in solution. Pioneers in the manufacture of De-ionizing equipment, ILLCO has been called on to supply pure water in a number of plating departments and users are enthusiastic about results . . . Without *heat*, without fuel, ILLCO-WAY De-ionizing units are daily producing pure water to meet exacting industrial and technical standards in leading U. S. Plants. Cost of the treated water is remarkably low — only a few cents per thousand gallons! Write for literature and installation details *today!*

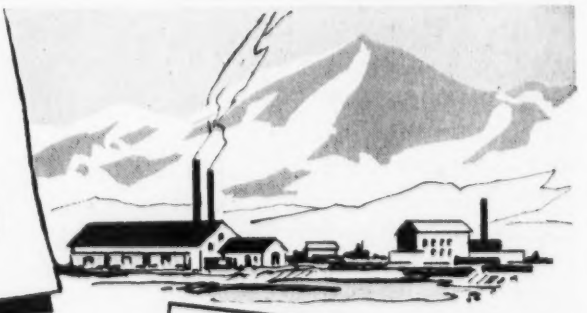
ILLINOIS WATER TREATMENT CO.

Water Treatment Engineers

856 CEDAR STREET, ROCKFORD, ILLINOIS

TESTED IN THE LABORATORY · ILLCO-WAY · PROVED IN THE FIELD

A PUMICE TO MEET EVERY NEED



Not until Valencia — the standard of American Pumice— was discovered at Grants, New Mexico, was it thought that a domestic pumice could match the quality of imported Italian Pumice. This inexhaustible deposit at Grants is true pumice stone and not a volcanic ash. It is physically and chemically equal in every respect to the now unobtainable Italian Pumice. • The Valencia plant's output of grades for every need is rigidly under control for particle size, purity, weight and color.

Check this table comparing Valencia with the highest grade of imported Italian Pumice. See for yourself that Valencia is truly the standard of American Pumice.

	American Pulverized Per Cent	Italian Select Per Cent
Silica	72.90	73.24
Alumina	11.28	10.61
Iron Oxide	.86	1.57
Titanium Oxide	.06	.10
Calcium Oxide	.80	1.10
Magnesium Oxide	.36	.40
Soda	3.64	3.03
Potash	4.38	5.58
Sulphuric Anhydride	.03	.05
Loss on ignition	5.20	4.04

Distributors of
THE PUMICE CORPORATION
of
AMERICA
GRANTS NEW MEXICO

WHITTAKER, CLARK & DANIELS, INC.

260 WEST BROADWAY • NEW YORK CITY

Warehouses: Detroit, Michigan and South Kearny, N. J.

Facts you should know

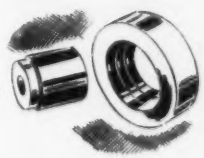
ABOUT TODAY'S CHROMIUM PLATING

THE CHANCES are that you already have an over-all picture of the many virtues of chromium plating . . . its extreme hardness, high resistance to chemical attack, unusual surface properties, etc., etc.

But very possibly you do not know all the ways in which these properties are being utilized in the war effort . . . the countless applications where one, two or several of the advantages of chromium plating have proved invaluable in stepping up production . . . improving performance . . . or saving priceless time and materials.

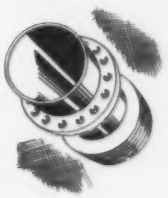
The facts here, of course, must be extremely brief, but complete information on each specific application is available both to our present licensees and to any interested manufacturer. Having pioneered in the chromium plating field, United Chromium makes available the results of years of research and development work — covering all the ramifications and possible uses for electro-deposited chromium.

INCREASING OUTPUT OF METAL-WORKING TOOLS



Chromium plating not only increases the life of many tools but often reduces stoppages and speeds output, as in the case of drawing and forming dies. Chromium plated drills are cutting more holes between sharpenings. On burnishing bars, chromium steps up production, produces a finer finish. These and many other tools are returned to service by rebuilding worn surfaces with chromium.

REDUCING WEAR ON CYLINDERS AND RINGS



Where equipment parts such as cylinders, piston rings and other parts of internal combustion engines are subjected to wear, and can utilize an oil-retaining type of finish — chromium plating having the proper degree and depth of porosity results in greatly improved performance. Large quantities of such parts are now being processed by our licensees to meet severest operating conditions.

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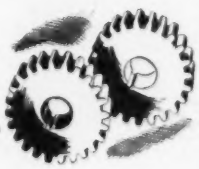

By chromium plating parts which have been machined off-size, many plants are reclaiming rejects — saving the metal as well as man-hours of labor represented in each piece. Successful applications of chromium for salvage include: — cylinders, pistons, axles, drive shafts, gears, valves, ball and roller bearing parts, and many types of taps, dies, jigs, fixtures and gauges.

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7. **Reduce waste due to rejects.**
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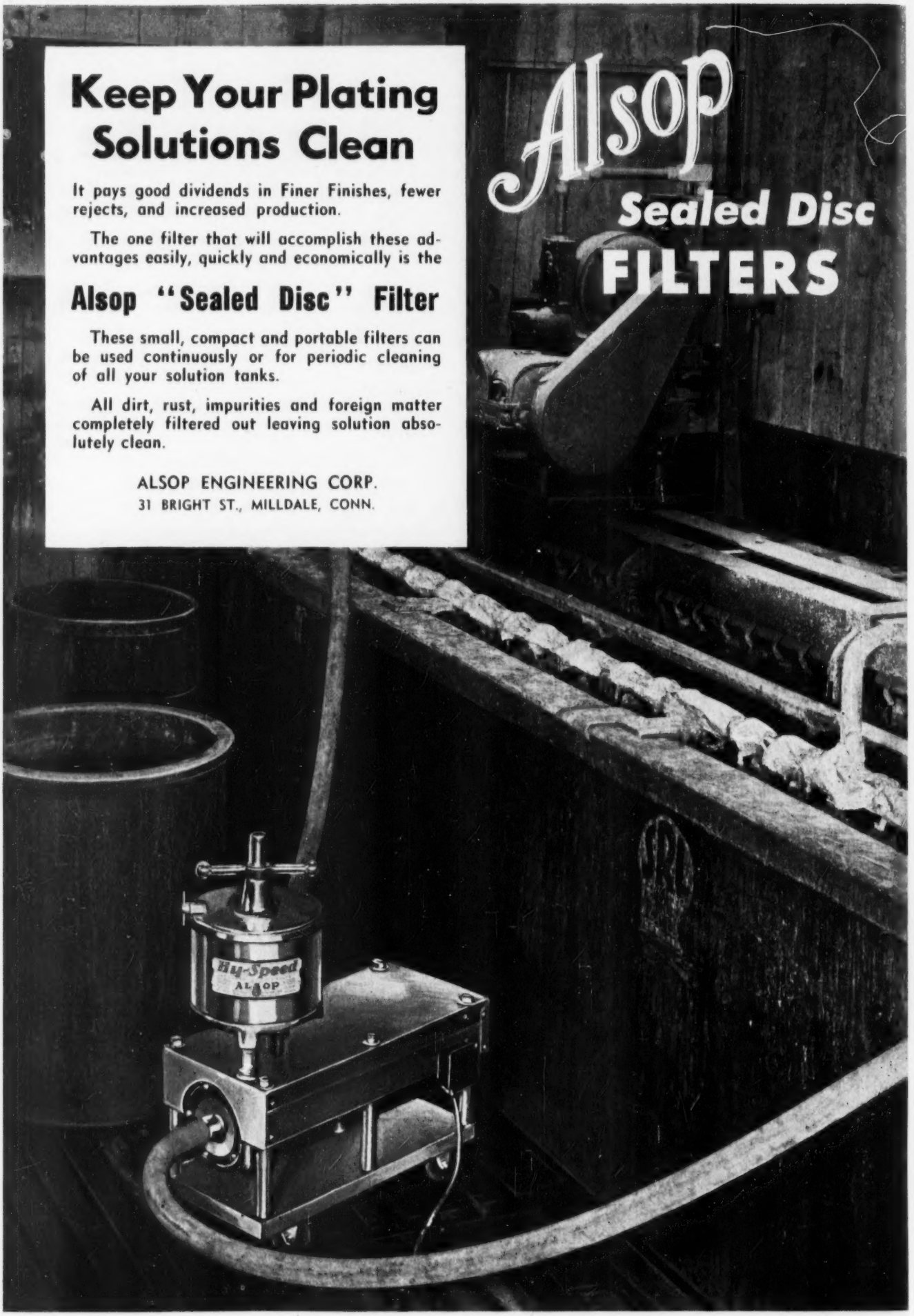

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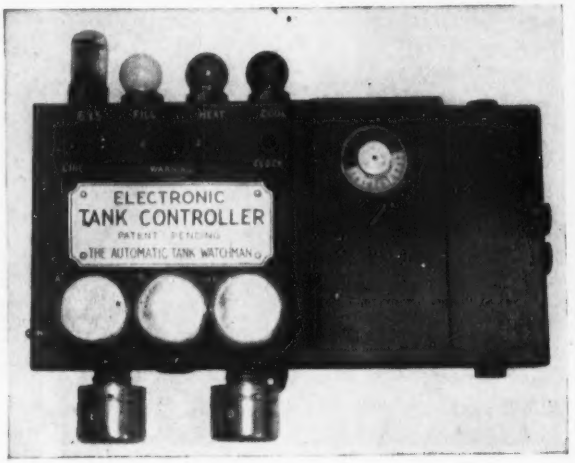

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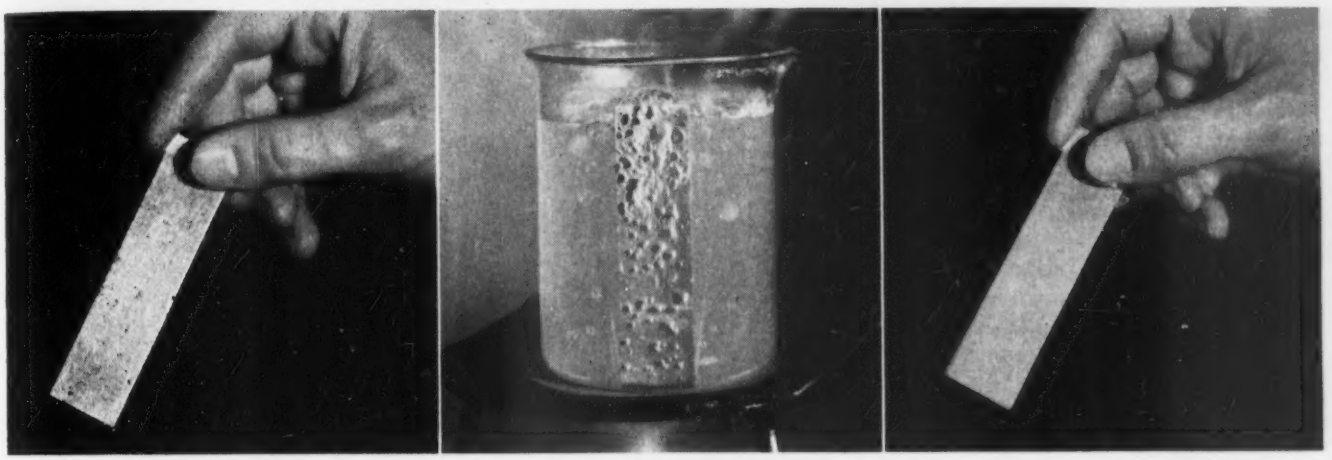

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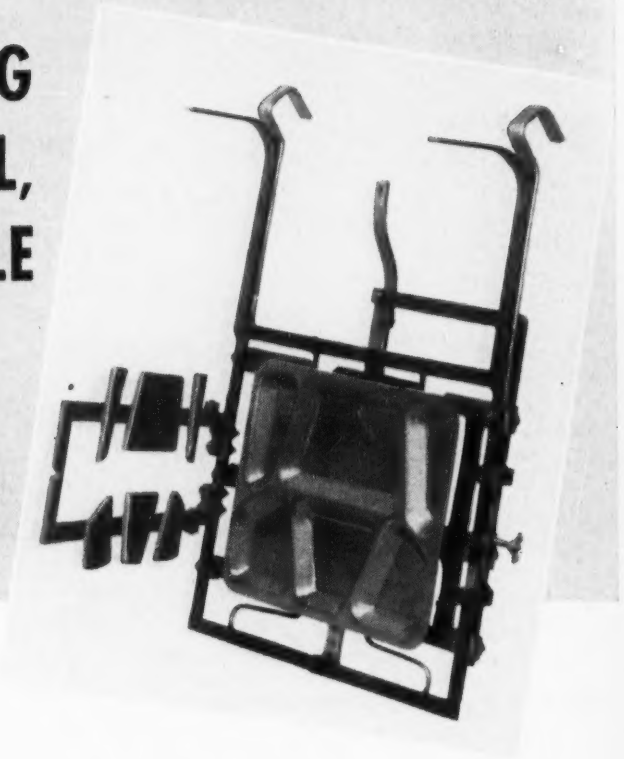
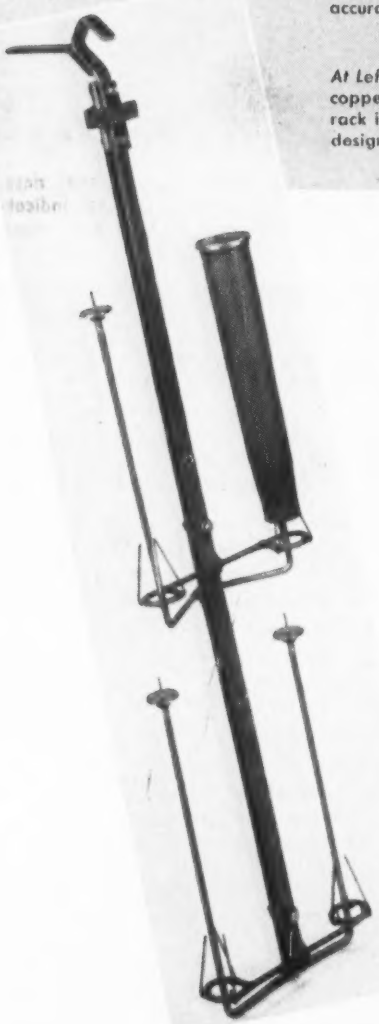


At Right. A typical Nankervis plating fixture, designed to do this difficult job, well. Note sturdy construction and accuracy of detail of the fixture.

At Left. A Nankervis rack used in the copper plating of shell casings. This rack is typical of the many specially designed racks from our shops.



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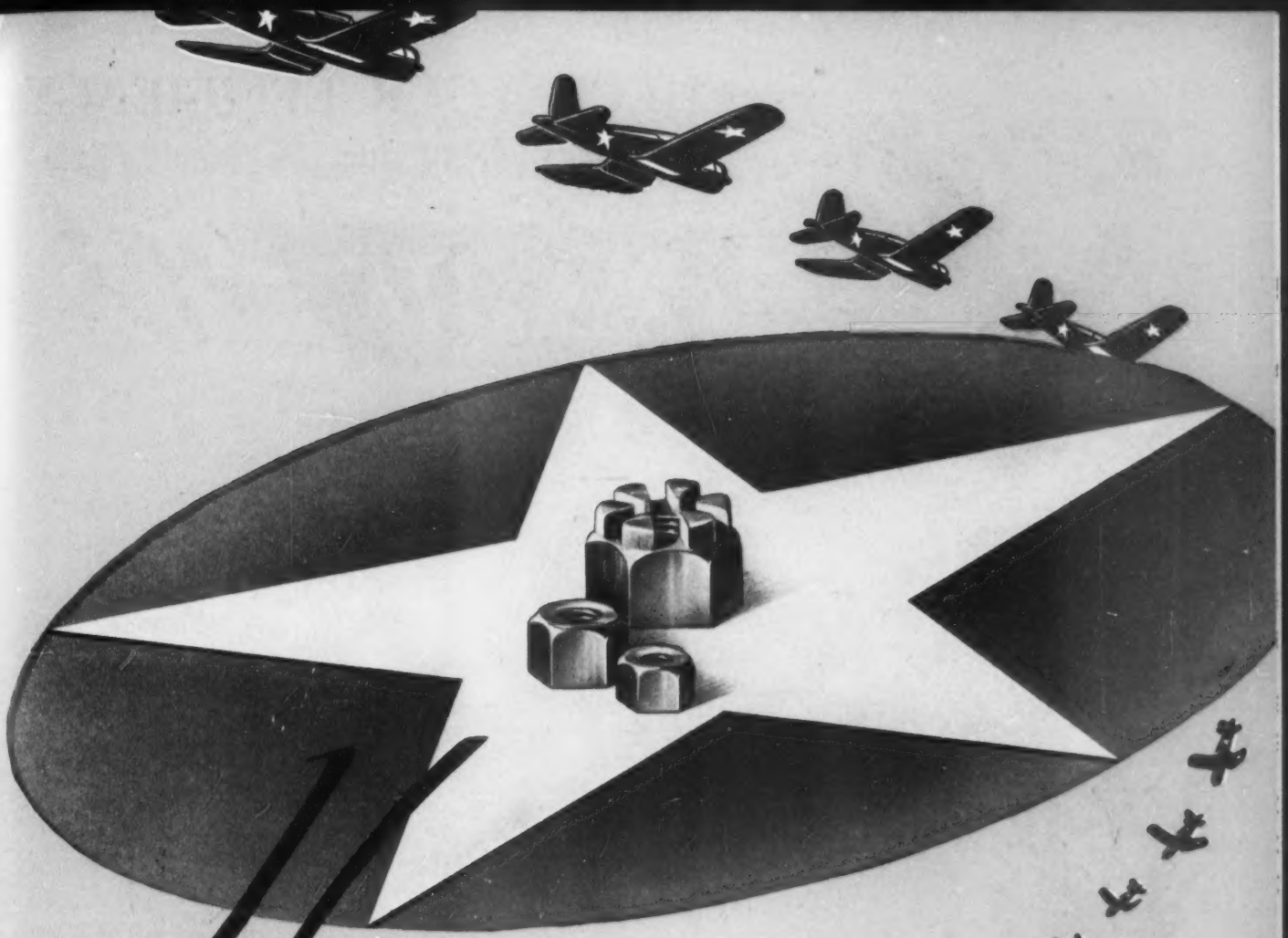

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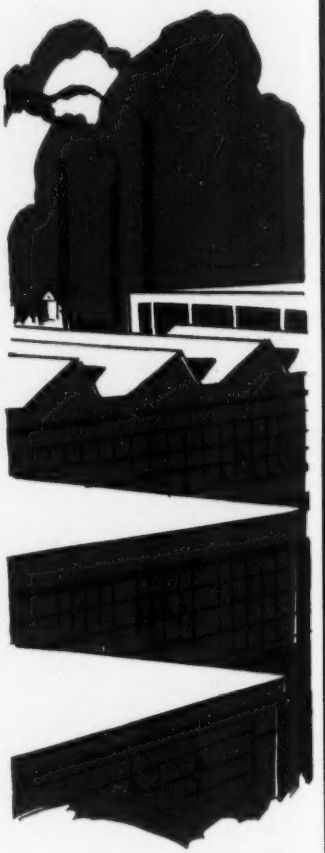

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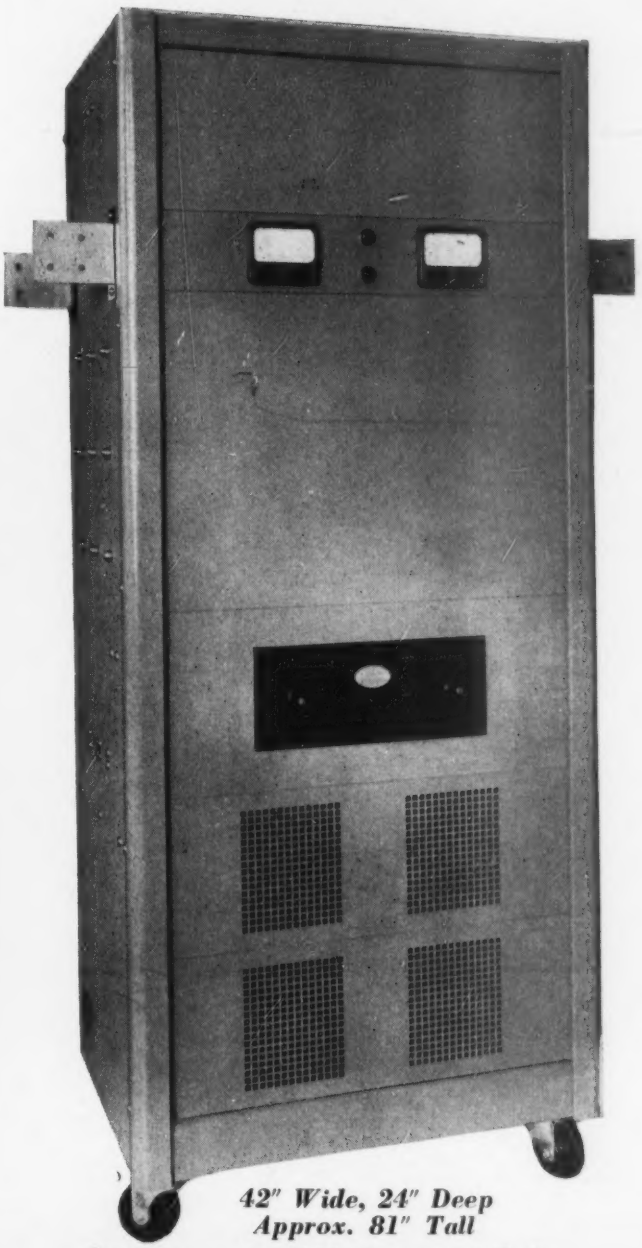

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VOL. 41, NO. 11 METAL FINISHING NOVEMBER, 1943
PREPARATION, ELECTROPLATING, COATING

ELECTROLYTIC TIN PLATE

For more than a year newspapers and magazines have not allowed us to forget that electrodeposition has been responsible for one of the greatest conservation accomplishments of the war, namely the production by this method of tin coatings on sheet steel can stock. Electrodeposited tin of the order of 0.5 lb. per base box was claimed to be equivalent, for a good many purposes, to 1.25 lb. per base box, the minimum which can be applied by hot-dipping, thus permitting a saving of two-thirds of the tin ordinarily used for this purpose. We were beginning to think that a tremendous new field was being opened up for plating, especially since about two dozen continuous strip plating lines, representing an investment of possibly thirty million dollars in equipment, have been put into operation or are scheduled for completion shortly.

Those who attended the New York meeting of the Electrochemical Society last month and sat through the session on "Strip Steel and Wire Plating", however, must have been profoundly impressed by the actual picture, as described by Dr. K. W. Brighton. Presenting the can maker's point of view, he produced the results of a large number of comparative tests on both electrolytic and hot-dipped plate with various food packs, indicating that 0.5 lb. electrolytic tin plate was not quite suitable for sanitary cans, that is, food containers, even when subsequently lacquered.

Although for specialties and for some dry packs, the light electrolytic coating is satisfactory, in view of the fact that lacquered 0.5 lb. electrolytic tin plate offers practically no economic advantage over 1.25 lb. hot-dipped plate, there is the possibility that, after the war is over and the necessity for tin conservation is removed, the process may drop into the background. By that time, however, the electrolytic tin plate manufacturers will have gained much valuable experience and will undoubtedly be prepared to compete with hot-dip plate on a quality basis and with the additional advantage of being able to offer continuous coils with a uniform coating unobtainable by the hot-dipping process.

Black Nickel Plating

By J. G. POOR

Underwood Elliott Fisher Co., Hartford, Conn.

PART I

THE electrodeposit known as black nickel has been given a somewhat ambiguous name. So many difficulties have been experienced in the deposition of this material that perhaps the process well deserves a very black reputation. On the other hand it frequently happens that the color of deposits is about as consistent as the Aurora Borealis and from this standpoint perhaps we should refer to the deposit as "*rainbow nickel*".

In the field of business machine manufacturing, with which the author is associated, black nickel has been quite extensively used. Choice applications for the finish in this industry are close fitting parts requiring a black surface which has eye-appeal, moderate resistance to corrosion and in some instances moderate resistance to wear or abrasion. In spite of carrying out his regular production of the finish in accordance with available instructions for satisfactory results, he has had his share of difficulties. These difficulties together with the lack of much definite knowledge of the operating characteristics of the plating solution and of the nature of the deposit itself led to the conclusion that considerable value might be found in carrying out a laboratory investigation of as many features of the process and deposit as possible.

Bath Formulas

Many black nickel solution formulas have been proposed and used with reported success by practical platers. Usually such formulas can be placed in one of two general classifications. In one classification the bath is strongly alkaline and contains arsenic, sodium cyanide, nickel, zinc, and at times, ammonia. In a second classification the bath is acid in reaction and contains a sulfocyanide, nickel, zinc, and an ammonium salt, usually nickel ammonium sulfate or ammonium sulfocyanide.

Both types of solutions are comparatively complex in their composition and the alkaline-arsenical bath especially so. In the case of the alkaline-arsenical bath, maintenance of uniform composition through routine chemical analysis would be quite difficult and it is strongly advised that the use of this type of solution be avoided because of the very poisonous nature of arsenic. There is the hazard of handling the arsenic solution in the plating department and the possible danger to users of the plated articles inasmuch as arsenic is known to be contained in the black deposit obtained from this solution. Another and perhaps the greatest potential hazard in operating such a solution is the possibility of the very poisonous gas arsine being liberated at the cathode during the plating operation. It is suggested that persons operating such plating solutions carefully investigate this latter possibility.

Discussion of solution formulas brings to mind an authentic story of how an unwanted but quite satisfactory black plating solution was obtained through accidental contamination. In the case in mind, a nickel plating solution storage tank had been installed on a floor directly above a barrel zinc plating unit. A leak developing in the storage tank caused a small amount of nickel plating solution to drop down through the floor and into the zinc plating bath with the result that for several days excellent black deposits were obtained. Perhaps this goes to support one contention that bath composition in black nickel plating is not at all critical. It is felt, however, that it is quite possible that several black nickel solution formulas had their origin in accidental contaminations of this sort.

For production plating it was considered desirable to select a bath whose operating characteristics were best established, and naturally one of as simple composition as possible. Because at least two of the components in the sulfocyanide solution were known to be rapidly plated out during electrolysis and not restored to the bath through anode functioning, it was also considered advisable to select a bath of relatively high concentration. Providing a greater reserve of material for deposition, this might yield more uniform operating behavior with less frequent analyses and additions required for proper maintenance. The formula selected has been suggested in several references.

	oz./gal.	*g./L.*	*approx. normality*
Sodium sulfocyanide, NaSCN	2	15.0	0.20
Zinc sulfate, $ZnSO_4 \cdot 7H_2O$	5	37.5	0.25
Nickel ammonium sulfate $NiSO_4(NH_4)_2SO_4 \cdot 6H_2O$	6	45.0	0.20
Nickel sulfate, $NiSO_4 \cdot 6H_2O$	10	75.0	0.50

Experimental Procedure

With two exceptions, all of the experimental work to be described was carried out using the same bath formula as used in production plating. Except in preparing deposits for chemical analysis, solutions were made up using chemicals of ordinary technical purity. Salts were dis-

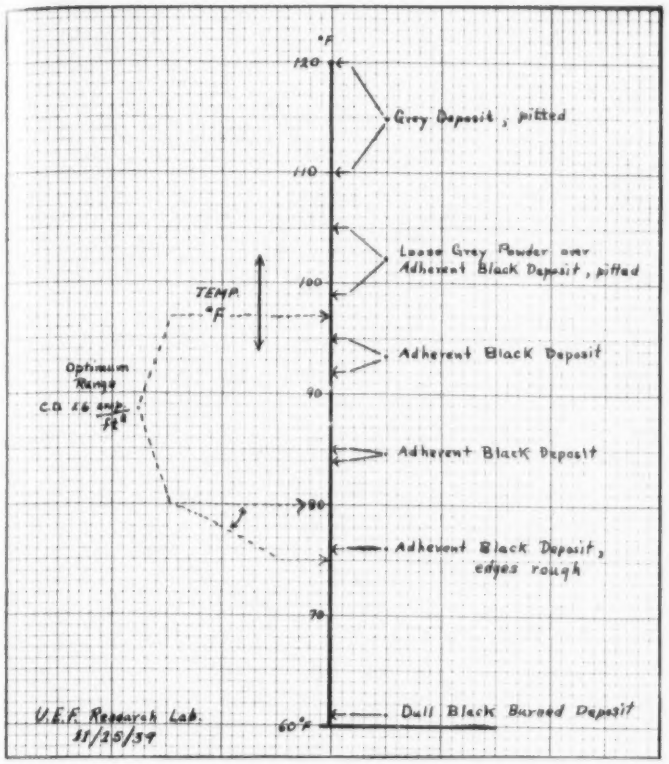


Fig. 1. Showing effects of temperature changes in the operation of a standard black nickel bath with the pH value held constant between 5.9 and 6.0 and the current density at 1.6 amp./sq. ft.

solved, the pH value adjusted to the range desired by adding either sulfuric acid or ammonium hydroxide and solutions finally obtained were filtered to remove all visible suspended matter. During the course of experiments, the electrolyte was frequently discarded so as not to allow the composition to change appreciably due to the plating out of bath components not restored by anode functioning.

A rectangular plating cell, having a capacity of 4½ liters or about 4¾ quarts, was used and the solution was heated intermittently with an electric immersion unit. Anode and cathode arrangement was of the conventional type, two flat anodes being placed on opposite sides of a flat cathode with all flat surfaces lying in parallel planes. Anodes used were 99%, rolled nickel cut from regular elliptical anodes and had an effective surface area while in the plating cell of about 28 square inches.

Except as noted, the cathodes were nickel plated cold rolled steel. Nickel plating was done using a modified Watt's solution, the nickel deposit averaging 0.0005" thick. The nickel deposits were not color buffed or polished prior to black nickel plating and had the satin appearance of so-called white or grey nickel. Cathodes thus prepared in small batches were temporarily stored in dilute sulfuric acid prior to black nickel plating. The surface area of the cathodes was about 18 square inches so that the ratio of cathode area to anode area was approximately 1 to 1½. Anode to cathode spacing in the black nickel plating cell was about 4¼ inches.

Variable Temperature

The first factor to be explored was temperature while pH value and current density were held at values generally considered optimum for this type of solution. The time of deposition in every determination was 30 minutes. Results are shown graphically in Figure 1. It should be noted that the optimum temperature range for black deposits is somewhat higher than has been generally recommended.

Agitation

To observe the effects of agitation, a series of cathodes was plated while the solution was well stirred using a motor driven device. The pH value, current density, period of deposition, and the particular temperatures at which various cathodes were plated were the same as in the first experiment.

Two effects were brought about by agitation. There was somewhat less luster at high current density areas of the cathodes and deposits were invariably badly pitted by the adhesion of gas bubbles during deposition. It was later discovered that aeration of the solution is almost certain to cause such pitting and the agitation used in this experiment was such that some aeration of the bath undoubtedly took place.

Time (Development of Color)

In order that the appearance and distribution of the deposit during various stages of deposition might be followed, cathodes were plated for varying periods of time up to 30 minutes. All other conditions were the same as in the first experiment, except that temperature was maintained within the newly determined optimum range of 85-90°F.

It was found that up to five minutes' plating time the color of the deposits ranged from one end of the color spectrum to the other. This play of colors was perhaps due to the extreme thinness of the deposits, which, approaching the wave length of light, caused the well known interference effect. Results of plating for other periods were as follows: At 10 minutes, a uniform gray deposit; at 15 minutes, a dull black deposit; at 20 minutes, a semi-lustrous black deposit, and at 30 minutes, a uniform lustrous black deposit.

Current Density Range at Various Temperatures

The current density plating range at a variety of temperatures was explored, using the same pH value and period of deposition as in the first experiment. This exploration

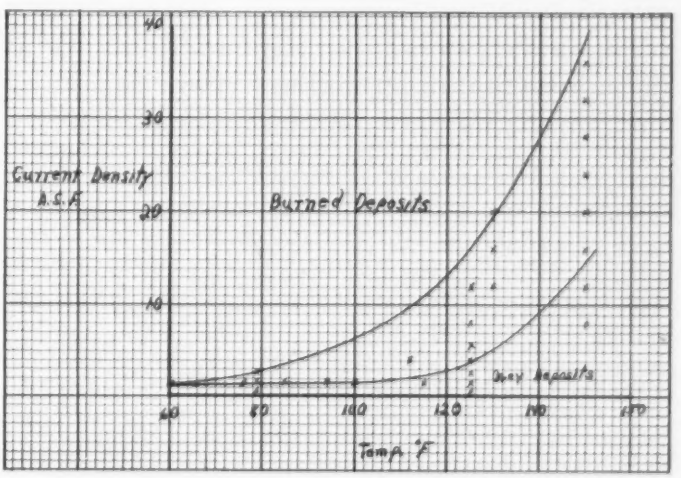


Fig. 2. Illustrating the relationship between temperature and current density in the standard black nickel bath operated at a pH of 5.7-6.0.

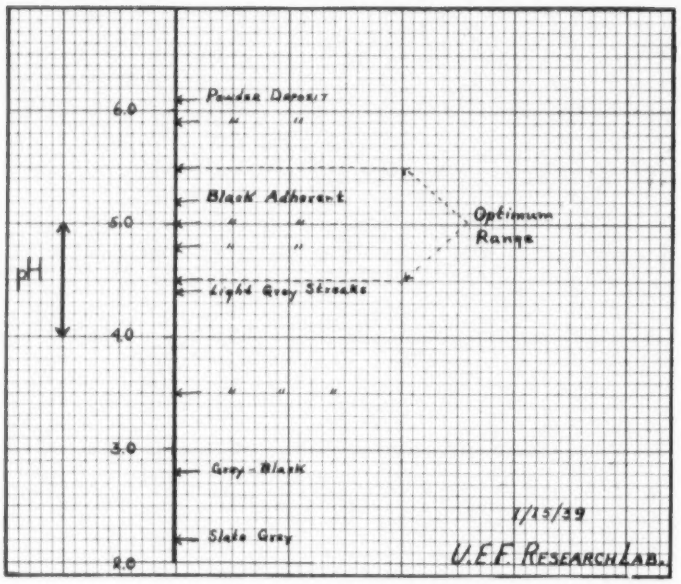


Fig. 3. Showing the effects of variable pH on a standard black nickel bath. Temp. 85°F. Current density 0.8 amp./sq. ft.

was not too thoroughly carried out at certain temperatures, but a very interesting, and it is thought valuable, relationship was observed between the temperature and current densities within which black deposits are obtained. Data are shown in Figure 2.

It may be possible that the composition of the black deposits obtained at the higher current densities and temperatures varies from that obtained in the narrow section of the plating range. However, the physical appearance of the black deposits throughout the range was nearly the same. Commercial plating has been done with quite good results at temperatures up to about 120°F. and at current densities of about 10 amp./ sq. ft. Plating time to develop deposits which were comparable to those produced at conventional temperature and current density was thereby reduced from 20 or 45 minutes to about 10 minutes. Cathodes plated at 150°F. within the black current density range were at times irregularly covered with white specks of what was assumed to be a basic zinc salt.

pH Value and Current Density Range

The effect of varying the pH value was partially investigated by plating two additional series of cathodes; one at a pH of about 5.4 and the other at a pH of about 5.1. Again, the plating time was 30 minutes while the temperature was 150°F., at which point white specks of the supposed basic zinc salt had made their appearance while operating at pH 5.9-6.0. The range of average current density covered was from 4-36 amp./sq. ft.

At these lower pH values the black plating range was broadened slightly. White specks again appeared on cathodes plated at low current densities in the bath at pH 5.4, while no such precipitation occurred at any current density in the bath at pH 5.1. Smooth, black deposits were obtained in both low pH baths at between about 12 and 30 amp./sq. ft and considerably more luster of deposit was noted at the lower pH value.

Boric Acid as Buffering Agent

The maintenance of a desirable pH range in the sulfocyanide type of bath has been found to be rather difficult. In an attempt to improve the regulation some electroplaters have made additions of boric acid just as would be done in ordinary nickel plating. Some of the effects of such boric acid additions were determined in this study. Boric acid was added to our standard bath at the rate of 4 oz./gal. and deposition carried out over a wide range of pH values while temperature was maintained at about 85°F., and one current density at about 0.8 amp./sq. ft. The period of deposition was 30 minutes. Results are tabulated in Figure 3.

As can be seen the optimum pH range for adherent black deposits was found to have been lowered appreciably by adding boric acid. Quite erratic results were obtained as the current density range of the buffered solution was further explored at various pH values. Generally at the higher pH values deposits were either loosely adherent or covered with brown streaks and the current density range for adherent black deposits was quite narrow. Some fairly promising results were obtained in the low pH—high current density range.

Elimination of Ammonium Salt from Bath

Up to this point, no information had been acquired as to the function of ammonium salt in the sulfocyanide bath. It was considered that if ammonium salt had no very essential function, its elimination from the bath composition would be a welcome simplification.

The effect of eliminating ammonium salt was briefly studied by preparing a bath in accordance with our standard formula but substituting a chemically equivalent amount of single nickel sulfate for the nickel ammonium sulfate prescribed by the formula. Plating was carried out under the following conditions; pH value, 5.9; temperature, about 130°F.; plating time, 30 minutes.

At current densities up to about 2 amp./sq. ft. deposits were gray in color, while at higher current densities the deposits consisted of a loosely adherent black powder. A considerable increase in the amount of gassing at the cathode was noted as compared with deposition in the standard bath containing ammonium salt. In addition it was found that whereas the pH value in the standard bath tends to rise during electrolysis, in the ammonium salt free bath it rapidly falls. As will be seen in a section to follow, black nickel deposits from the standard bath contain an appreciable amount of nitrogen, probably present as ammonia or in the ammonium radical.

(To be continued)

Abstracts of Papers Presented Before the Electrochemical Society's 84th Meeting in New York, Oct. 13-16

A Selection of Subjects Particularly Interesting to the Electroplater

CORROSION OF TIN-NICKEL ALLOY COATINGS ON STEEL IN CANNED FOODSTUFFS

By H. R. Copson and W. A. Wesley

The galvanic behavior of steel coupled with tinplate, tin-nickel alloy coatings and nickel was observed during exposure to typical corrosive canned foodstuffs under anaerobic conditions. The results indicated that the alloy coatings were anodic to bare steel in four of five goods tested and not appreciably cathodic in the fifth. This, together with observations of the degree of corrosion which occurred, led to the conclusion that nickel-tin coatings are potential substitutes for heavier tin coatings so that a substantial saving in tin may be possible. The tin content of the alloy coating is useful in overcoming the noble potential of pure nickel and to take advantage of the marked inhibiting effect of tin compounds upon the corrosion of steel laid base at pores, bends and defects in the coatings.

ELECTROLYTIC TINPLATE FROM THE CAN MAKER'S POINT OF VIEW

By K. W. Brighton

The successful introduction of electro-tinplate replacing hot dip tinplate is an epoch-making contribution of the electrochemist. It is not practical to apply tin coatings by the old hot dip method that are less than 0.000075" (1.9 $m\mu$.) thick. On the other hand electrodeposited coatings of tin less than 1.1 $m\mu$. thick have proved to be acceptable. This means a substantial saving in tin over the old process. After the war it is expected that 0.00003" (0.75 $m\mu$.) thick electro-tinplate will find considerable application in containers for non-processed products such as coffee and crackers. Numerous corrosion tests are tabulated. At present cans made of 0.5 lb./base box electro-tinplate (0.00003 in. or 0.75 $m\mu$. thick plate) must be inside and outside enameled to provide performance approximating that obtained with hot dipped tin plate (1.25 lb./base box).

CONTINUOUS PLATING OF FINE STEEL WIRE WITH NICKEL

By James H. Conolly and Richard Rimbach

Due to the scarcity of nickel, a nickel plated steel wire is used today in place of solid nickel wire for tungsten filament supports in incandescent lamps. The steel wire passes through a concentrated Watts' nickel plating bath at the rate of 12 ft./min. (90 mm./sec.); at a current density of 200 to 600 amp./sq. ft. (22 to 65 amp./dm.^{2}); a bath pH of 2.0 and a bath temperature of 60°C. A very adherent nickel deposit (0.005 mm.) is obtained that may be safely subjected to sharp bends and which satisfactorily protects the steel basis during the life of the lamp.

A SULFATE-CHLORIDE SOLUTION FOR IRON ELECTROPLATING AND ELECTROFORMING

By R. M. Schaffert and Bruce W. Gonser

A sulfate-chloride iron electrolyte has been developed, having a composition: ferrous sulfate, 250 g./L.; ferrous chloride, 42 g./L.; ammonium chloride, 10 g./L. Although the bath is particularly applicable to electrotyping and surfacing of stereotypes, other applications are suggested. The bath remains stable over long periods, and iron deposits produced are less brittle than with either normal sulfate or chloride baths. Operating conditions, characteristics of the bath, and the character of the deposits are discussed.

THE DEVELOPMENT OF THE CRUCIBLE STEEL ELECTROLYTIC TIN PLATE PROCESS

By Edward W. Hopper

Electrolytic tin plate has numerous advantages over hot-dipped tin plate. It can be produced in light coating weights not possible with any other method and with much greater uniformity of tin coating. The Crucible Steel Company of America was the first to produce, commercially, brightened electrolytic tin plate.

CORROSION OF LEAD-INDIUM DIFUSSION ALLOYS

By J. M. Freund, H. B. Linford, and P. W. Schutz

Tests to study the chemical corrosion of lead and lead indium diffusion alloys by lubricating oil at 170° to 180°C. showed that no protective film is formed in the corrosion of lead. It was found that indium inhibits the attack on lead, that completeness of immersion is important, and that lead sulfide is one of the products of corrosion.

IRON PLATING

By William B. Stoddard, Jr.

An improved chloride iron plating solution is described. Grain size is controlled by the addition to the solution of relatively small amounts of manganese chloride. Pitting is eliminated by the use of the proper wetting agent. Temperature and pH ranges are considerably widened for the production of good deposits by the use of the manganese addition. Current efficiency is more than 95% in uncontaminated solutions. Physical properties of the plate are given.

TIN PLATING FROM THE POTASSIUM STANNATE BATH
Part II

By Frederick A. Lowenheim

The effects of changes in bath composition upon the operating characteristics of the potassium stannate tin plating bath are reviewed and new data offered concerning the effect of tin content on the anode efficiency. All results reported are based on very thin deposits, since the work is directed toward the application of electrotinning steel strip. The effect of foreign ions is investigated. Full-scale plant experience with the bath is reviewed.

THE ELECTROGALVANIZING OF STRIP STEEL

By Ernest H. Lyons, Jr.

The early history of the electrogalvanizing of strip steel demonstrates its advantages, namely, extremely uniform coatings of any desired weight, which will withstand severe forming. The cleaning of the steel and the arrangement and operation of the plating tank are outlined. Zinc coated steel, bonderized and lacquered, is especially resistant to corrosion and may replace more critical materials. The nature of the somewhat heavier deposit on the edge of the strip is discussed. Because the Preece test is often misleading, it should be replaced by stripping tests. The salt spray test is of little value.

STUDY OF THE DEPOSITION POTENTIALS AND MICROSTRUCTURES OF ELECTRODEPOSITED NICKEL-ZINC ALLOYS

By Benjamin Lustman

The deposition potentials and composition of electroplates deposited from a bath containing mixed chlorides of zinc and nickel were measured over a wide range of current densities and temperatures and the microstructures of the resulting electroplates determined. Changes in deposition potentials at critical current densities were correlated with the equilibrium phase diagram of nickel-zinc alloys. The microstructures of the alloy electroplates were examined with respect to their surface characteristics, phase distribution, and banding.

PURE TUNGSTEN DIRECT FROM TUNGSTEN ORE
1. Electrolytic Tungsten from Fused Borax and Fused Phosphate Baths

By Colin G. Fink and Chuk Ching Ma

The purpose of the present investigation was: (1) to find a simple method for the production of tungsten metal directly from tungsten ore; (2) to investigate new fused salt reagents for the decomposition of tungsten ores; and (3) to study the phenomena of tungsten crystal growth in a fused electrolyte bath. Experimental results showed than a WO_3 recovery of 98 to 99% can be obtained by fusing tungsten ores with alkali borate or alkali phosphate. On the other hand, the fused alkali carbonate bath for the electrolytic production of tungsten metal has several disadvantages: (1) low current efficiency; (2) low electrolytic conductivity; (3) rapid graphite anode consumption (due to attack by carbonate ions); (4) "tungsten bronze" formation when an excess of tungstic oxide is employed; and (5) resolution of cathodically deposited tungsten in an excess of alkali oxide. Experiments showed that crystalline tungsten from borate and phosphate baths can be produced electrolytically and economically. Tungsten ore of almost any type and of any grade, high or low, can be directly charged into the bath. The optimum conditions of temperature, composition of electrolyte and current density were determined.

ELECTRODEPOSITION OF COBALT-TUNGSTEN ALLOYS FROM AN ACID PLATING BATH

By M. L. Holt, R. E. Black and P. F. Hoglund

Cobalt-tungsten alloys have been electrodeposited from a cobalt-tungsten plating bath which was prepared by adding sodium tungstate to a modified Kalmus type cobalt plating bath. Changes in alloy composition and cathode current efficiencies were studied at various current densities, bath pH's and bath temperatures. It was found that the amount of tungsten in the cathode deposit was greatest when the tungsten content of the bath was relatively high and when the electrolysis was carried out at the lower current density range with the higher bath pH and temperature. The tungsten content of the deposits varied from 1% to 16%. Deposits varied in appearance from dull, streaked and non-metallic to bright and metallic, depending on conditions. The cathode efficiency was best at the higher current densities, particularly at the higher bath pH range. A typical satisfactory bath contained 1 to 2 g./L. tungsten with electrolysis carried out at a bath pH of 3.5 to 4.5, a bath temperature of 65 to 70° C. and a current density of 3 to 4 amp./dm.^{2}

CORROSION RESISTANCE OF SILVER PLATED STEEL: PHOSPHATING TIN STEEL PLATING

By Philip J. Lo Presti

The corrosion resistance of steel is usually not improved by the application of a thin coating of silver. On the other hand phosphating the steel surface does improve its corrosion resistance. A combination of the two processes has been tried in the past but results have not been conclusive. Accordingly, the present investigation was undertaken. The most important finding is that silver plating steel after phosphating markedly improves the adhesion of the silver to the steel. It appears that although most, if not all, of the phosphate coat disappears during the first stages of silver plating, the phosphate coat protects the steel surface during that brief interval before the silver is discharged and deposited. Photomicrographs support this conclusion.

DISTRIBUTION OF GALVANIC CORROSION

By H. R. Copson

The distribution of the galvanic corrosion of a nickel-to-steel couple in open, slowly moving, tap water was estimated from measurements of potential differences in the water around the couple. The distribution was confirmed later by thickness measurements. The two methods were in excellent agreement. The maximum galvanic corrosion of the steel occurred at the junction of the two metals and decreased as the distance from the junction increased. The maximum effect at the junction was 3½ times the average galvanic corrosion. The normal uncoupled corrosion of the steel was greater than the average increased corrosion due to the galvanic effect despite the three-to-one area ratio of nickel to steel. Potential measurements can be made as soon as a steady state is reached, but it usually takes considerable time for corrosion to become extensive enough for thickness measurements to be accurate.

NOVELTIES IN ELECTROPLATING

By Oliver P. Watts

This report covers three investigations: (1) Brilliant multicolored electroplates were obtained from ammonium molybdate solutions. (2) A study of the codeposition of nickel and copper led to the development of a citrate-cyanide bath. The bright hard alloy deposit contained from 60 to 80% nickel, balance copper, depending upon plating conditions which are specified. (3) Attempts to codeposit chromium with either copper or iron were unsuccessful.

The Antiquity of Tools

By JOSEPH DANFORTH LITTLE

PART III

THE oldest known combination of materials constituting what may be called works of men and existing as such at the present day, are the pyramids of Egypt. The tools and contrivances used at the building of the early pyramids are not known. Those who have investigated the subject place the erection of these early pyramids at about 2,120 B. C. That would be about a century before Abraham arrived in Egypt or about 4,000 years ago. There are no hieroglyphics on these and they do not carry their history as some Egyptian tombs do. We must all have great admiration for these old stone workers especially when we consider the pyramids and temples which were made of stone. The Egyptian stone workers and masons must have been of an inventive turn of mind and wonderful craftsmen, for the tools used were extraordinary. They had saws some eight feet long, made of bronze, which they used for cutting stone. It is said that some of the saws had jewels set in the metal for teeth, in order to cut the hard stone. It is also claimed that they used diamonds for drill points as we do today. To build such great structures as the pyramids, they had to have many tools such as measuring tools, plumb lines, levels, and squares. They were indeed wonderful workmen and knew how to use their leveling tools, for the pyramids and buildings show wonderful accuracy and exactness in construction. Consider the number of tools necessary to equip the large force of workmen erecting the Great Pyramid. It is said that to build this one pyramid it took 100,000 men, working three months each year for many years and that it took ten years to clear the site and build the road over which the material for the structure was hauled.

More and more people are becoming interested in the question of the great antiquity of man upon this earth. In various parts of the world trained archeologists have worked for years tracing the history of the human race back to its earliest beginnings and from time to time, the public hears of epoch-making discoveries resulting from these wide spread researches. Occasionally, by great good fortune, the actual bones of ancient man are unearthed; yet the overwhelming mass of evidence of his existence at remote periods takes the form of implements and weapons made of stone.

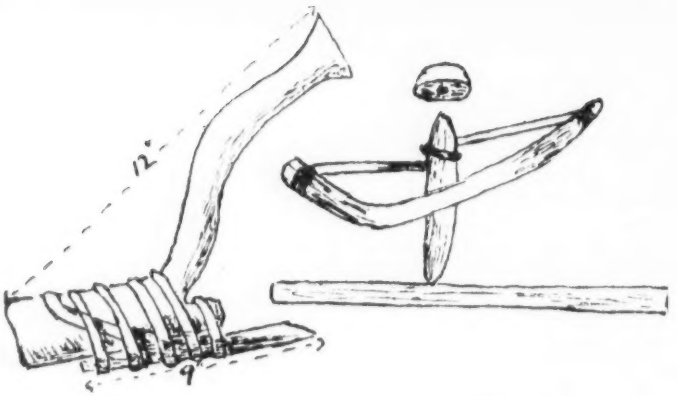
Archeologists tell us that there is evidence of man in the Quaternary or Drift Period, tens of thousands of years ago and with other evidences of this existence, there have been discovered rough flint tools, which must have been indispensable to him, for his dress was composed of skins and though he may have killed his game with a club, a knife of some kind was necessary to skin the animal. Weaving, we are told, was known in the Mesolithic Age, or roughly about 7,000 B. C. Needles made of bone have been found dating from the early stone age, which followed the Quaternary Period. Needles can reasonably be regarded as old as the age of weaving. About 5,000 B. C. the Egyptians had gold needles with two eyes drilled in them, at right angles to each other. An Assyrian drill brace, filled with a flint drill, was in use about 7,000 B. C. and it is therefore probable that some similar instrument was used by the Egyptians for drilling the eyes of their needles.

Prehistoric Man and His Tools

Prehistoric man with his stone axe and chisel, and a skillful and ingenious use of fire which he drew out of two bits of wood by friction, brought down the massive forest tree and moulded out of its trunk a boat, serviceable for all his requirements in the navigation of rivers or estuaries and particularly in the transfer of his corn and other heavy burdens from one place to another. The tools of man of the Quaternary or Diluvial Period, which were found with exhumed bones, bear unquestionable marks of human workmanship and in most instances are specialized or made for certain definite uses.

In the early Stone Age men adapted sharp or blunt stones to fit their hands and thereby extended the usefulness of those hands. Still older flint objects which hark back to the Tertiary strata have been found and these also show evidence of human workmanship. Man's progress has proceeded by a succession of infinitely small changes. One of these epoch-making events occurred when our hairy and homely progenitor discovered the effectiveness of a stone for cracking a coconut or the skull of a rival. In making this discovery, if he did not inaugurate the age of the tool, he at least prepared the way for it. He also discovered that a sharp point was a means of piercing and a sharp edge a means of cutting. He had learned that pointed things pierce, sharp things cut and heavy things crush, and slowly

Chisels and brace drill and bit—2,400-1,700 B. C.



Adz for stone or wood and bow-drill—2,400-1,700 B. C.

came the adaptation of these to particular purposes, resulting in the pick, the chisel, and the hammer and still more slowly, the specialization of each of these into its many forms. Skill in the use of tools and man's dependence upon them has ever increased and as a consequence there has been a corresponding increase in their employment and adoption.

Many caves have been found to contain the remains of former occupants, enabling us to trace the history of their habitations during a long succession of ages, extending from the remote past of geological time to periods which are historically linked to the present. It is in caves that we note the first indubitable traces of man's existence on earth. During some of the earliest stages of his history, man appears to have used caves for the burial of his dead and also for his habitation.

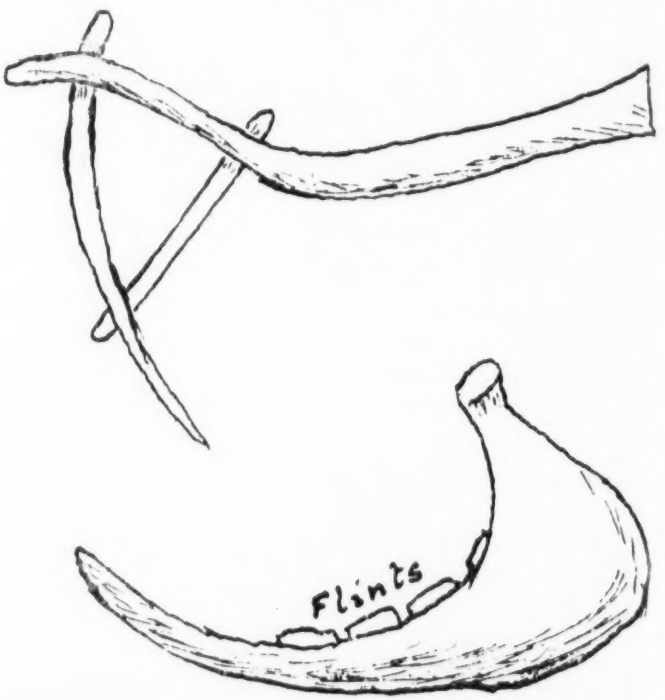
We read in Homer of caves on the shores of the Black Sea. We learn from the Pentateuch that the early inhabitants of Palestine buried their dead in caves and from the remains of man found in these caves, his weapons, his tools, his utensils and his ornaments, we may form a tolerably accurate idea of his habits, the extent of his civilization and some of his conditions of life. In many drift gravels of rivers, valleys and in many caves and rock shelters are found stone implements, tools and weapons, coeval with remains of the mammoth, rhinoceros, cave bear and other animals long extinct. Many of these are rough chipped tools of a very early period.

Improvement in Tools

Then came implements of higher art, those of polished stone, and in the course of time came the Bronze Period, when metal took the place of stone. This was followed by the age of Iron, the first days of which overlapped that of Bronze. Its early dawn was prehistoric. The amount of skill evidenced by the rough remains found gives us a guide as to their antiquity. It must be remembered that in these early days there was no iron to dig with, only sharp-edged stone for cutting purposes. The skins to be dressed down were scraped with a thumb-shaped flint which could rub and not pierce or cut the skin. Needles were required and were shaped from fragments or splinters of the bones of rabbits and birds by flint flakes and the eyes were bored with a pointed tool. All these operations were the expected outcome of natural necessity. This was the period when the use of metals for cutting instruments and tools was unknown and man had to depend upon stone, bone, wood and other readily accessible natural products for his implements and weapons of the chase or of war. That period was succeeded by one, in which the use of copper or copper alloyed with tin or bronze became known and gradually superseded the use of stone for certain purposes. In turn, a time arrived when bronze gave way to iron and steel as being a superior metal for cutting purposes, and it has remained in use up to the present day as such.

There is no doubt about stone tools, instruments and weapons having been fabricated in the very earliest time by barbarous people, before the use of copper, iron and other metals was known. We cannot help wondering how people of early Biblical times lived without tools and weapons. When we think of Adam, whatever may have been his mental condition, his personal equipment in the way of tools and weapons must have been inefficient and limited. No artificer was instructed in brass and iron until the days of Tubal-cain (3,800 B. C.), sixth in descent from Adam's outcast son, at which time a generation was reckoned as a hundred years instead of twenty-five or thirty years as now. Surely Tubal-cain must have had in his tool kit, the best set of tools of his day! How interesting it would be to those of us who love and use tools, to see them!

Sacred scripture tells us that Noah built an ark or boat of great dimensions and in it he built rooms and he pitched the ark within and without with pitch and he made it with first, second and third stories and placed a window in it (Gen. 6-14 to 16). It must have required much mechanical skill, many tools, and familiarity with tools and the use of metals to have built such a structure. The inference one naturally draws is that long before the Flood, man had passed through the three ages, the Paleolithic, the Eolithic, and the Neolithic and had reached the Bronze Age or at least the Age of Metals and Tools. While we do not find any direct historical testimony nor do we find any evidence of writing having developed in this stage of culture, nevertheless from time to time we do find in the soil and in rivers, indirect circumstantial evidence of the use of stone tools and implements, even where those of metal had been employed for centuries before authentic history commences.



Hoe and sickle—2,500-1,700 B. C.

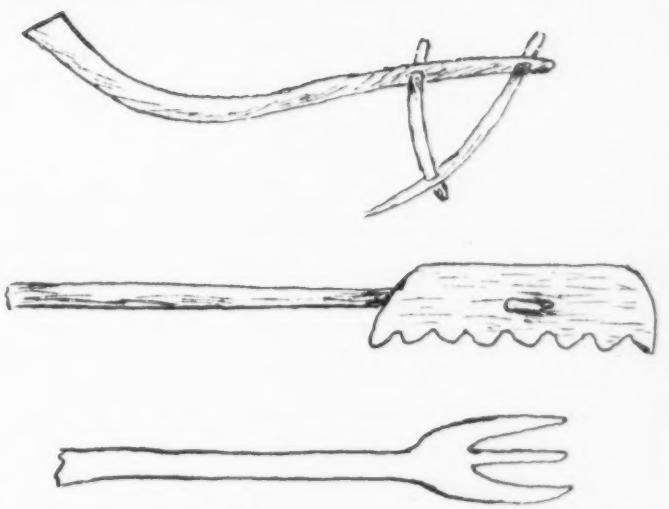
It is evident that before the use of iron or bronze or both together first became known to the barbarous nations of the West of Europe, they were unacquainted with the use of these metals and were therefore in that stage of civilization which has been characterized as the Stone Age.

The Stone Age has no fixed chronological epoch in the world's history but by the Stone Age we designate a time when people were unacquainted with the working of metal. Stones of various kinds were used as material from which cutting implements and weapons were manufactured. It was in this age that all tools, weapons and the like were made of wood, stone, bone, antlers, or ivory. After the Stone Age came a period when the smelting of copper and the hardening effect produced by alloying it with tin, that is, the manufacture of bronze, had been discovered and was practiced. After that came a period when mankind had learned to prepare and work iron for all purposes.

Flint—Prehistoric Man's Steel

One of the greatest benefactors of mankind was the prehistoric man who first thought of flaking a piece of flint to a rough cutting edge. There is no doubt that the industry of stone implement flaking, conducted hundreds of thousands of years in the past, was one of the most important ever undertaken by man. The chief source of flints were the chalk deposits of the Cretaceous Age which occur so plentifully in Western Europe and especially along the Southern coast of England. Wherever flint occurs, Stone Age implements and relics are apt to be abundant. At Grime's Graves in Northwest Suffolk, England, are the prehistoric pits where the finer flint was dug by prehistoric man. These old pits were dug with deer's antlers as picks and flat bones as shovels, and it is impossible for us to realize the difficulty and magnitude of the work undertaken by these early people. These pits, circular in form, have revealed an astonishing number of flint tools, implements and other relics of these ancient miners. It is difficult to imagine how the progress of man could have been achieved if he had not had such a remarkably suitable material as flint from which to make his implements.

The industry of making articles of flint is a very old one and in that early period man was quite ignorant of the use of, indeed of the existence of, metals and he made his rough axes, hammers, spear heads, knives, skin dressers, and piercing tools of flint. The general use of flint all over the world by Stone Age man, is remarkable and seems to prove how stern was the necessity that drove man without metals to the discovery of that which was of such excellent service in supplying the need for hard, sharp, and useful tools and implements. Flint and steel enjoy an age reputation actually greater than that of the pyramids. In fact we have every reason to believe that this was one of the methods of making fire as far back as the Age of Stone itself. The earliest flint blades apparently were grasped merely with the bare hands of the craftsman. The first step toward a mechanical device for directing the blade was hafting—attaching the flint by means of withers, tendons or rosin to the end of sticks used as handles. Later a further refinement of hafting occurred when the composite tool was developed. This consisted of small flint teeth which were set into bone or wooden handles to form harpoon heads, saws, and crude sickles. When looking at a flint tool such as a hand-axe, few people realize the skill with which it was made. The earliest known implements and tools were formed almost exclusively from pieces of flint which had been roughly flaked along the edge.



Plough, rake and fork for turning straw—2,500-1,700 B. C.

When we think of the environment of the early races of man, we are so accustomed to think in terms of our own surroundings that any others strike us at once as strange and unreal. Aside from air and water, man's first needs were food getting and some method of self defense. He needed something to supplement his teeth, nails, and fists. The most omnipresent and tangible of all materials were wood and stone. Both of these were abundant along watercourses. The stones were there because the streams carried them there or laid them bare. The most utilizable of all stones is flint because of its hardness and mode of fracture which leaves a sharp, comparatively straight edge. Once the flint-using habit was formed, it spread. The method employed by primitive tool makers is of interest because their selection of so hard a material as flint and the possibility of working it at all with their crude appliances seem almost incomprehensible. Our ancestors were just as keen about the quality of their flint as we are about that of our steel. They even imported it from long distances.

Stone arrows and spear heads were made by a process of cleaving and chipping, requiring mechanical skill, precision and accuracy not easily matched by the stone cutter of the present day, particularly if he were required to perform the task with the same implements as those used by his ancestors. The arrow heads used in ancient wars were so ingeniously contrived with barbs and so purposely attached to their stocks that when hurled by the bow, they pierced the enemy's flesh and could not be withdrawn, but broke from the shaft and remained buried in the wound, insuring the desired result.

It is impossible to fix any hard and fast date limits for the close of the Stone Age, for the beginning of the Bronze Period, or for the commencement of that of Iron. The transition from one to the other must have required a long course of years to become general. Doubtless tools and implements of stone continued in use long after those of bronze and iron had been invented, probably arising from the scarcity of metal articles; but when the art of smelting and working in iron and steel had sufficiently advanced, the use of stone, and afterwards of bronze, tools and weapons ceased altogether.

Eliminating Working Differential Between Laboratory Plating and Production Line

By JACK McGEE

Chief Chemist, Wyandotte Paint Products Co., Wyandotte, Mich.

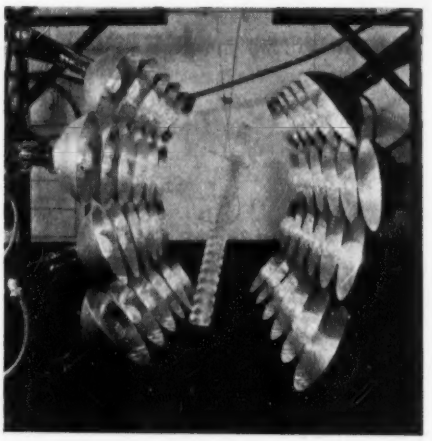
I THINK it will be generally conceded that results obtained by laboratory beaker plating are not often duplicated in production plating without costly delays and a sizeable expenditure of effort, expense and time. This is readily appreciated when the facts are carefully weighed. In the laboratory all the plating conditions are ideal—temperature of the solution is easily controlled by mechanical means (the small volume lends itself to almost perfect control, with a plus or minus variation of only two or three degrees); equipment is thoroughly clean (the solution, being generally fresh and most likely unworked, is contamination free), and the beaker tank, being glass, gives a perfect insulation.

Expanding these laboratory results to a thousand gallon production tank is more than a mere conversion by multiplication. Many values must be taken into consideration—values on which there are no conversion tables—chemical and mechanical variables which can not be expounded and theorized by chemical formulas or mathematics.

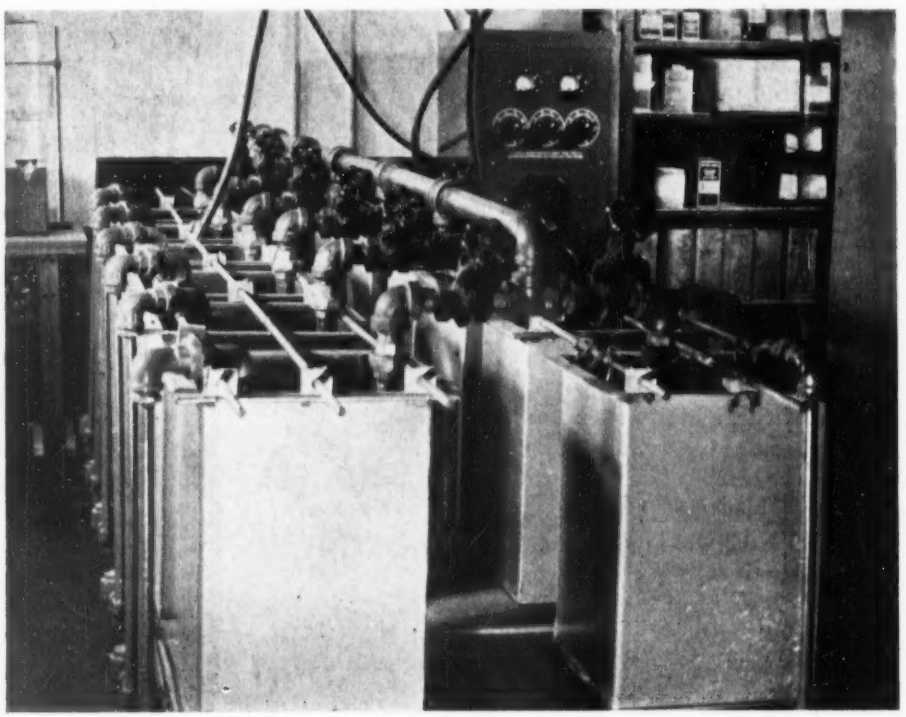
The laboratory results must be taken through an intermediate step. The old saying "There is many a slip between the cup and the lip", is in many instances applicable to results between laboratory plating and production plating. Especially today, when the war effort demands speed and tolerances to the minutest degree, does this difference demand some correcting medium.

The "slip" must be eliminated—but how?

The one greatest stride towards correcting this working differential is the incorporation of what is called a "pilot plating plant" between the laboratory and the production line. I think we have all experienced the pain and discouragement derived from failure of a production job paralleling laboratory results on which hours or days of tedious labor and patience were spent. This recognized flaw is applicable to any phase of electroplating and electrodeposition whether it be for the innovation of plating technique and methods, the improvement of chemicals, anodes, mechanical equipment, tank linings, rack insulations, stop-off lacquers and compounds, or the preliminary laboratory work necessary before entering a complex plating job onto the production line. The pilot plant pictured and described in this article is the direct result of the need for some guarantee of success when laboratory work is being converted to production.

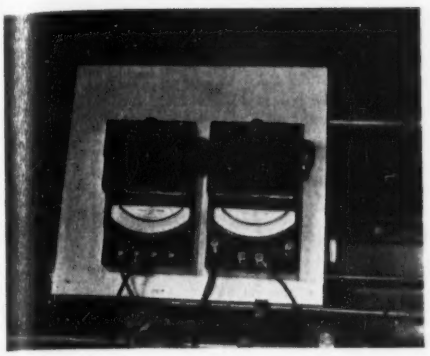


Forced-drying coatings with infra-red lamps.



View of laboratory showing cleaning and plating tanks.

This plant is fed electrically through a standard rectifier. Tanks operate with an 11-gallon charge of solution which we have found to give identical results to production tanks. These 11-gallon tank charges are large enough to be analyzed and corrected in event of error through compounding or in the working. The tanks are steam heated by individual 1" pipes;—48 inches of pipe are used in the individual heating coils, each coil being controlled by a graduated valve. In the anodizing tank the coil is connected to the cold water line and has been found to keep the anodizing bath



Ammeter and voltmeter check on current densities.

at the correct temperature without additional mechanical means of cooling. The cathode carrier bar is rigged to a reducing unit and motor which creates a continuous backward and forward motion equivalent to the speed of an automatic production unit. Also, not pictured, is a 60-gallon tank which can be charged for a test job on objects which are oversize and too bulky for the 11-gallon tanks. It is essential that this model plant include all the apparatus necessary for analysis—the instruments required to measure the physical properties of the operating solution and plating equipment and the plate of the finished object. In the illustrations we have attempted to show only the plating apparatus. Our analytical section is complete. It is not shown here nor will the equipment be listed in this article as it is the orthodox set-up with which we are all familiar.

The pilot plant is composed of the following basic equipment:

Hot water rinse tank
Cold water rinse tank
Alkaline cleaner tank (with reverssing switch for anodic or cathodic cleaning)
Acid crock
Anodizing tank
Hard chrome tank
Iron tank
Hi-speed copper tank
Silver tank
Nickel tank
Cadmium tank
Zinc tank
Tin tank
1 60-gallon tank which may be used as is or sprayed with insulation as the case dictates
Production rectifier
Individual carbon pile rheostats
Tong meter
Magnetic micrometer
Ammeter (0 - 25 amp.)
Voltmeter (0 - 30 volts)
Electrometric pH indicator
Bake ovens

Routine pH check of plating solutions.

This equipment should also include coating and drying apparatus which is not essential but which, in many cases, is desirable. Included and pictured on the opposite page is a set of 48 watt to 260 watt infra-red lamps. Not pictured is a gas oven and an electrical oven. These items are for the purpose of experimental work in the force drying and baking of coatings such as are used in plating plants, i.e., corrosion resistant paints, tank linings, rack coatings, stop-off lacquers and compounds. Spraying and dipping equipment is also included.

Drawings and complete information on this model plant are available from the writer who invites those interested to contact him.

CHEMICAL INDUSTRIES EXPOSITION TO BE HELD IN NEW YORK

A veritable revolution of method, invoked by the war, is sweeping all fields of industry to the great concern of manufacturers everywhere. With the war's crescendo, the approaching crisis in this industrial overturn gives special point to the 19th Exposition of Chemical Industries, which comes to Madison Square Garden, New York, the first week of December.

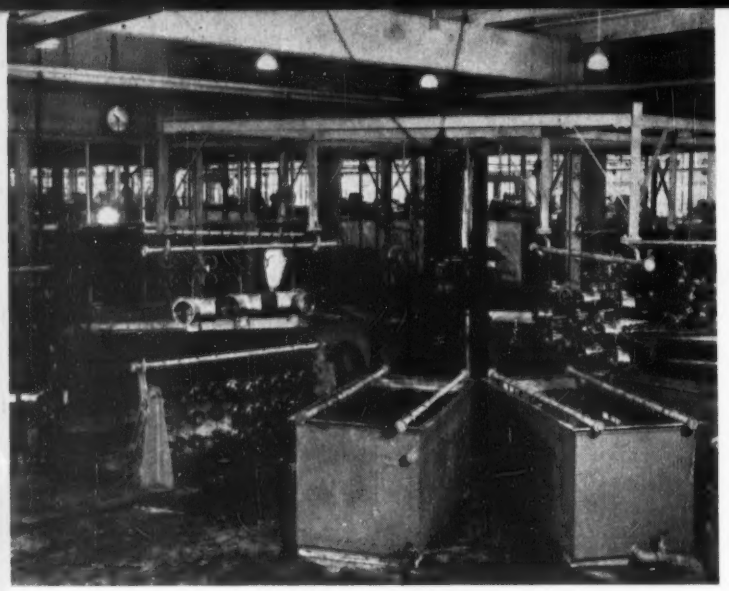
This will be the first great industrial review of its kind since the war began. As some thinking now runs, it may be the last before peace is declared. Before the next two years have brought around the 20th of these biennial expositions, war production must certainly have been further stimulated and the reconversion of industries to their peace-time pursuits quite possibly will be under way.

One of the significant features will be an exhibit by the Alien Property Custodian of the United States Government of the complete library of former enemy-controlled patents, now available for use under license by American manufacturers in chemical, electrical and mechanical fields. This collection, consisting of some 45,000 patents and patent applications, will be brought from Chicago especially for the Exposition. Representatives of the Custodian will be on hand to confer with visitors over possible grants of further licenses.

A great deal of equipment designed for the material and chemical producing industries will be shown, including the manufacture of acids, solvents, steel, oil refineries, mining and metallurgical as well as metal working industries, together with powder metallurgy and welding.

Some of the exhibits will be particularly applicable to the manufacture of delicate instruments, others to research laboratories. Still other exhibitors serve more directly power plants, public utilities and the communications industries.

As previously announced, the Exposition will be closed to the public, admission being by invitation and registration only to executives, chemists, chemical engineers, plant managers and staff personnel directly associated with industries having a chemical interest.



Airplane propeller parts being cleaned for plating on station-type conveyor. *Courtesy Curtiss Propeller Division, Curtiss-Wright Corp.*

Electrolytic Descaling of Heat-Treated Parts

By FRANK H. BUNKER

L. H. Butcher Co., Los Angeles, Cal.

THE Bullard-Dunn Process is of timely interest because of its important use in the manufacture of war products. The reason for its prominence lies in the fact that there is a tremendous amount of heat treated work done today that must be descaled completely without dimensional changes and the Bullard-Dunn Process has the unique ability to meet these stringent requirements.

The process removes scale and oxide from ferrous metal surfaces by electrochemical means. Its characteristic feature is that a continuous and non-porous film of metallic tin, electrodeposited on the work simultaneously with the scale and oxide removal, completely protects the work surface from pitting and etching. It is especially interesting to electroplaters because of its similarity to electroplating for, as in electroplating, a metal is deposited and the same type of equipment is utilized, as for example, generators or rectifiers for power, conveyors, racks and barrels.

The complete process consists of one or more of the three main steps: Grease removal, scale and oxide removal, defilming.

1. Grease removal is accomplished by using a highly alkaline, anodic, electrolytic cleaner. This bath is operated at six volts with the temperature close to boiling and usually at a concentration of 16 ounces per gallon.

2. The scale and oxide removal is effected in a bath containing sulfuric acid, a small concentration of tin and an addition agent which promotes a uniform, adherent tin deposit, increases the throwing power of the bath and reduces its surface tension. The bath is run at moderate temperature and high current density. The anodes are high silicon iron except for the one or two tin anodes that are employed to furnish the bath with its tin content. This bath operates over a wide range of conditions which makes it exceedingly practical.

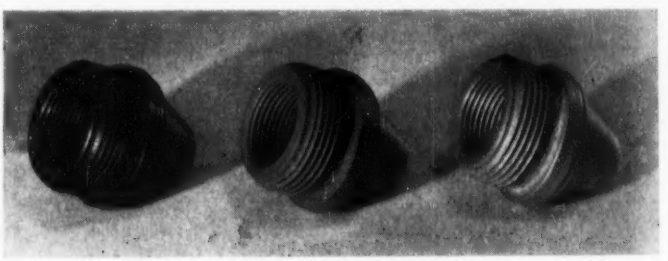
When this bath has completed its function, the work is free from scale and oxide and is covered with a film of tin. This tin not only protects the basic surface during the scale removal so that no etching whatever occurs, but it also imparts to the bath an exceptionally good throwing power enabling it to clean out holes and recesses.

3. Defilming or stripping of this tin, when desired, is very simple, being performed in the bath as described in step 1. Proprietary cleaners approved by The Bullard Company give the best results. Work is stripped clean and free of tin in from 30 seconds to one minute without any discoloration of the work.

The complete sequence of treatments for descaling work is as follows:

1. Alkali—degrease
2. Cold water rinse
3. Acid—descale
4. Cold water rinse
5. Alkali—defilm
6. Cold water rinse
7. Hot water rinse

Whether or not to use all of these steps is determined by the condition of the work and whether it is desired to leave the tin film on the work. For example, when work has no grease or carbon, steps 1 and 2, i.e., alkali—degrease and cold water rinse, are omitted. When the tin film is left on the work, steps 5 and 6 are omitted. When cleaning work for plating, a dip in cold muriatic acid (about 5%) follows step 6, after which the work is rinsed and then placed in cyanide or directly into the plating bath, depending upon the plating bath used. The cycle can be interrupted after the acid step before plating because the tin will protect the work until it is ready to be plated. At that point the operator would then proceed with the usual sequence, beginning with tin stripping.



Fuse Body.

Before Bullard-Dunn. ***After Bullard-Dunn.*** ***After plating.***

Work to be blackened is treated in the blackening salts after the alkali—defilming and rinse steps. Tin is usually left on work to be soldered or hot tinned. Work to be bonderized is dipped in 1-2% oxalic acid for one to two minutes after the alkali—defilm and rinse steps and prior to applying the bonderized coat. Parkerizing and Parco Lubrite do not require this oxalic acid step.

Before the war, when more tin was available, the usual practice was to leave the tin on the work except when it had to be removed as, for example, when work was to be plated. The protection it afforded made this procedure very desirable. Now that tin conservation is in order, the recommended practice is to remove it except when it contributes

* Covered by United States and foreign patents.

some essential advantage, or unless this stripping operation would entail a major change in existing equipment or involve more labor. Tin that is stripped from the work is available for further service.

In connection with work that is heat treated, oil quenched and drawn, it is well to point out that the cleaning treatment is greatly facilitated when the quench oil is removed prior to the draw. Otherwise it burns during the draw, leaving a carbon residue that is very difficult to eliminate.

Characteristics of the Process

Some of the characteristics of the process are:

1. No etching of work occurs. The racks are also protected by the tin film.
2. Excellent throwing power cleans out recesses and holes.
3. It produces chemically clean surfaces.
4. The tin film protects the work even after treatment.
5. Cleaning time is uniform.
6. Solution has long life. Iron build-up is from scale only, not from work.
7. It lends itself well for conveyorized handling because work easy to descale is protected from attack while work requiring longer treatment is being descaled.
8. There is no permanent embrittlement because work is not etched and the hydrogen that is absorbed is relieved on standing or removed completely and quickly by the application of heat (290°F. for one hour, or 400°F. for one-half hour).

The process is especially useful for the following applications:

1. To remove scale from parts with holes and recesses difficult to reach and where all scale must be removed, as in hydraulic control parts, Diesel engine nozzles, oil pipes for airplane engines, etc.
2. Where no dimensional changes can be tolerated, as in dies, rubber molds, gears and machine gun parts.
3. To remove scale completely prior to grinding. Scale being more abrasive than the base metal produces excessive wear and tear on grinding wheels, tools and cutters. (A steel propeller blade manufacturer reports increased life of grinding wheels by more than 200%.)
4. To remove scale or oxide and cover with protective coating as final finish in the same operation and bath.
5. To make surfaces chemically clean as required for parts that make up such units as refrigerator compressors.
6. To prepare surfaces for such finishes as plating, hot tinning, painting, phosphate coating or blackening. The best possible surface for plating is obtained with the process because a chemically clean surface is assured. This is attributable to several conditions including the unusually good throwing power created by the tin deposition. Obviously, the other acid methods lack this throwing power because there is no metal deposition. The gas agitation causes a scrubbing action and brings fresh solution to the work surface to aid the cleaning action. The stripping of the tin also contributes to the cleaning efficiency of the process because there is a tendency for the carbon to adhere to the tin and be removed when the tin is stripped. The tin film protects ground or polished surfaces while the rest of the piece is being cleaned, and the surface is cleaned so well that no brushing or hand wiping is necessary to remove buffing and polishing compounds, even when entrapped in engine-turned designs.

The tin left on makes an ideal surface for hot dipped coatings as in the centrifugal casting of bearings. High or low tin-bearing babbitts adhere equally well.

Painting or lacquering over the chemically clean surface or over the tin film offers excellent corrosion resistance. Paint over the tin defilmed surface provides good corrosion resistance, but not as good as over the tin film.

Surfaces respond to blackening much faster after the process.

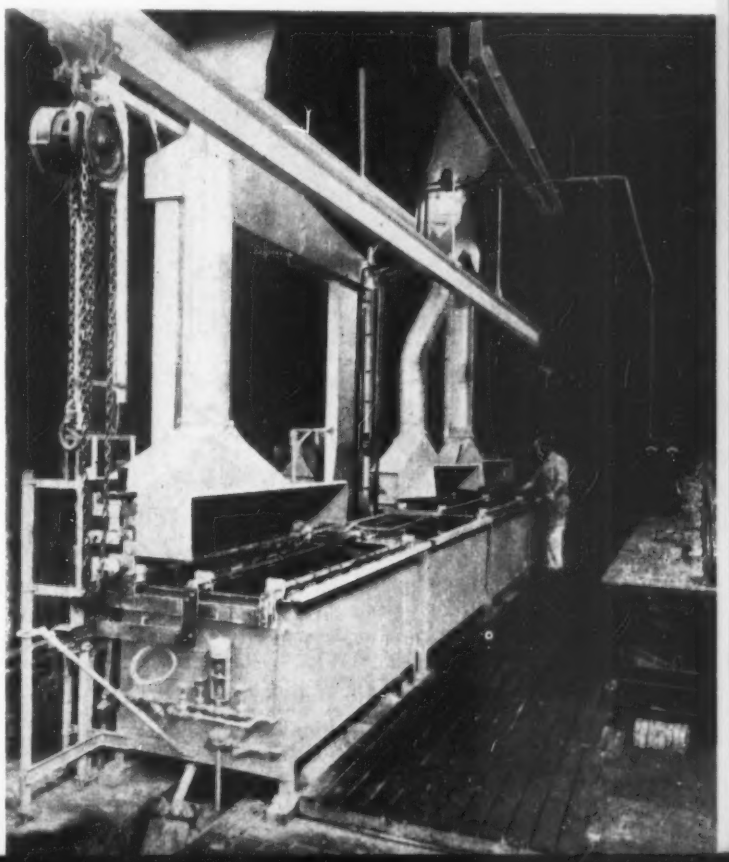
7. To prepare surfaces for welding or soldering. For welding, clean surfaces are essential for good bonds. In soldering, tin may or may not be left on. However, the electrolytic tin film offers protection against acid fluxes, assures good wetting of the piece by the hot solder, and protects the work until it is ready for soldering.
8. To clean and provide lubricant as in the hobbing of bullet dies and the drawing of steel cartridge cases.
9. To remove scale and oxide prior to inspection. For Magnaflux inspection the tin provides a good background which makes the Magnaflux lines stand out clearly.

Following are some examples of how the process is being applied for military products:

Aviation engine parts	(a) After heat treatment; (b) After machining prior to plating for "stop off" and corrosion resistance.
Airplane propeller hubs	After machining prior to plating.
Steel propellers	After welding and annealing.
Aircraft control bearings	After heat treatment and prior to plating.
Anti-aircraft gun roller bearings	After heat treatment prior to grinding.
Aircraft forgings	Prior to visual and Magnaflux inspection.
Airplane engine motor mounts	After heat treating before plating.

(*Concluded on page 727*)

Typical Bullard-Dunn manual unit. *Courtesy Pratt-Whitney Aircraft.*



Determination of Tin Coating Weights

By G. H. BENDIX, W. C. STAMMER and A. H. CARLE

Research Department, Continental Can Co., Inc., Chicago, Ill.

A procedure is described for the rapid determination of tin coating weights on tin plate. The tin is removed electrolytically in the presence of iodine and the excess iodine is back-titrated with sodium thiosulfate. The method is applicable to heavy and light coatings.

CHEMICAL analyses to determine the weight of tin coatings applied to sheet steel are made by producers and large consumers of tin plate. Since control laboratories performing this work may be called upon to make several thousand determinations per week, it is highly desirable that these determinations be made rapidly and economically. The necessity for performing a rather large number of tin coating determinations in this laboratory has instigated an investigation of the existing procedures.

The procedure most commonly used where a large number of determinations are to be made is that of Sellars (4). A definite area of tin plate, usually 4 square inches (25.8 sq. cm.) per side, is dissolved with heat in strong hydrochloric acid in an atmosphere of carbon dioxide. After cooling, stannous tin is titrated iodometrically to a starch end point with either standard iodine-iodide or iodate-iodide. This method is sufficiently accurate but fairly costly. Its speed is governed by the rate of solution of the steel samples and by the amount of equipment available for dissolving and cooling the samples under an inert atmosphere.

More recently Buser (1) has accomplished the solution of tin coatings electrolytically and without the aid of heat or the necessity for an inert atmosphere. In this method the tin plate specimen is made the anode between two carbon cathodes. The electrodes are immersed in a beaker containing hydrochloric acid, to which has been added a measured amount of standard iodate-iodide solution. Passage of a direct current through the cell for a few minutes results in solution of the tin in the stannous state. Oxidation by iodine to the stannic state follows immediately. The excess of iodine is then titrated with sodium thiosulfate and the amount of tin is calculated from the decrease in iodine. Calculated stoichiometrically, high results will be obtained. Buser has, therefore, applied a correction factor obtained by comparison of his results with those obtained by other methods. Buser's method has definite advantages of speed and economy, but these are offset by the necessity for strict control of current density and of the length of time during which the cell is operated.

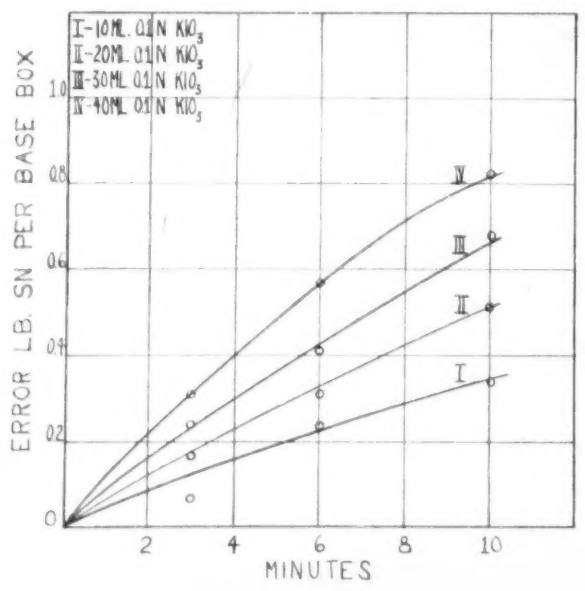


Fig. 1. Effect of iodine concentration.

Several solutions, which have the ability to remove tin preferentially from the base metal, have been utilized for quantitative determinations of tin on tin plate. These are usually referred to as stripping solutions, and determinations based upon their use consist of weighing the sample before and after removal of the coating (2). Antimony trichloride in hydrochloric acid and alkaline lead acetate solutions have found favor in cases where laboratory facilities are limited. Stripping methods are compartively time-consuming and do not quantitatively remove that portion of the tin which is alloyed with the iron.

Theoretical

When an electric current is passed through a cell consisting of carbon cathodes and a tin plate anode in a medium of iodine-iodide in hydrochloride acid, the following reactions occur, if there are no side reactions:

$$Sn = Sn^{++} + 2e$$
$$Sn^{++} + I_2 = Sn^{++++} + 2I^-$$
$$2H^+ + 2e = H_2$$

The amount of iodine consumed is therefore proportional to the amount of tin on the sample. In a cell of this type, as designed by Buser, there are several factors which may contribute errors, the sum of which is usually positive.

a. A negative error due to incomplete solution of tin under the clamp or clip which attaches the sample to the electrical circuit.

b. A negative error due to incomplete solution of tin or iron-tin alloy in cases where the current is not allowed to flow sufficiently long. [On tin plate made by immersing sheet steel in molten tin, a layer of iron-tin alloy, $FeSn_2$ is always present between the pure tin and the iron base metal. It may be dissolved anodically (3)].

c. A positive error due to the reduction of iodine by the ferrous iron generated at the anode.

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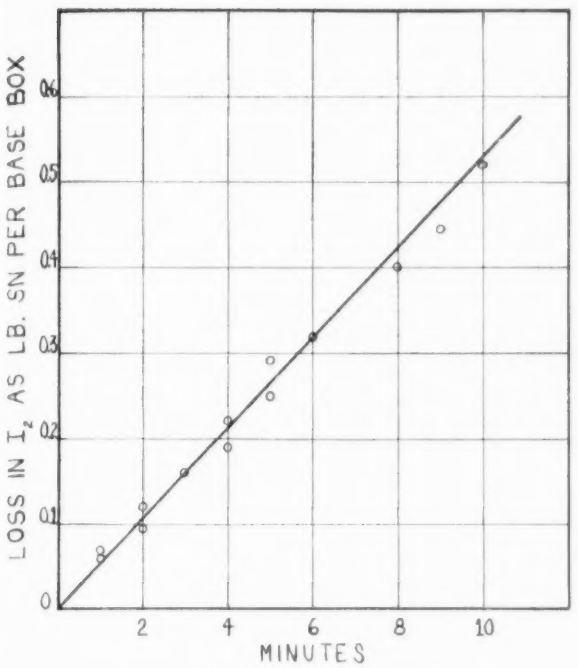

Fig. 2. Hydrogen reduction at cathode.

d. A positive error due to the reduction of iodine by hydrogen generated at the cathode.

e. Negative errors which result from air-oxidation of iodide and stannous tin.

Error *a* is dependent upon the size of the clamp or clip used to attach the specimen and is constant if the area covered by the holder is the same for each sample specimen.

Under the conditions described by Buser, error *b* is negligible if the cell is operated for a sufficiently long time.

The magnitude of error *c* varies with the concentration of iodine in the cell and with the time the current is allowed to flow. This is shown in Figure 1 where the error, expressed as tin, is plotted against the time of cell operation for four different concentrations of iodine. (Tin coatings are expressed as pounds of tin per base box, one base box having an area of 31,360 square inches per side.)

To obtain the data for these curves, the tin was first stripped completely from a 4-square-inch tin plate specimen. The remaining base metal was then made the anode in a cell similar to that of Buser's, except that a porous wall was interposed between the cathode and anode chambers. Various amounts of 0.1 *N* iodide-iodate solution were introduced into the anode chamber together with 200 ml. of 1 to 4 hydrochloric acid. The cathode chamber contained only hydrochloric acid. A current of 3 amperes was allowed to flow through the cell for various time intervals and the decrease in iodine was determined by titrating with sodium thiosulfate. By confining the iodine to the anode chamber reactions occurring at the cathode were eliminated from consideration.

Figure 1 shows that the greater the concentration of iodine the greater will be the reduction of iodine. In an actual determination involving tin plate, relatively little iron is dissolved until after the tin has been removed. It is, therefore, unlikely that there is appreciable reduction of iodine by ferrous iron until after the tin has been stripped from the specimen.

Error *d* has been demonstrated experimentally by immersing a carbon cathode in a cathode chamber containing a measured amount of iodine-iodide in 1 to 4 hydrochloric acid, and separated from the anode chamber by a porous wall. After a current of 1.5 amperes had flowed through the cell for various time intervals, the loss of iodine was determined by titrating with thiosulfate. Under these conditions any decrease in iodine may be attributed to reactions occurring at the cathode. The curves in Figure 2 show that where the cell is operated at 1.5 amperes a loss of iodine equivalent to 0.05 pound of tin per base box occurs for each minute of cell operation.

Error *d* can be held at a minimum by allowing the current to flow only long enough to dissolve the tin. During an actual determination this cannot be done without danger of incomplete solution of tin from the sample (error *b*). Unlike error *c*, which does not occur until after the tin coating has been removed, error *d* occurs throughout the electrolysis if hydrogen is liberated in the presence of iodine.

Errors *e*, which are caused by dissolved oxygen, produce low results. The oxidation of iodide to iodine will be negligible if concentrations of iodide and acid are not excessive and the analysis is completed without undue delay. That the oxidation of stannous tin by oxygen will be prevented if iodine is present throughout the electrolysis, is demonstrated below.

Apparatus and Procedure

In order to eliminate error *d*, which is the most significant, a cell (Figure 3) was constructed. In this cell the cathodes are surrounded by porous cylinders (Coors filter, No. 720, size 1) which allow the hydrogen to escape without coming in contact with the iodine. *A* and *A'* are two identical porous filters filled with 1 to 4 hydrochloric acid and containing cylindrical carbon cathodes, *B* and *B'*. *C* is a small electromagnet (coil not shown) which holds the sample, *D*, at its edge without covering the tin surface, thus eliminating error *a*. *E* is a 400-ml. beaker into which the standard iodine is measured, together with 1 to 7 hydrochloric acid until the solution just covers the sample.

A source of direct current of from 3 to 5 volts will be sufficient to give about 3 amperes, through the cell shown in Figures 3 and 4. The current need not be controlled accu-

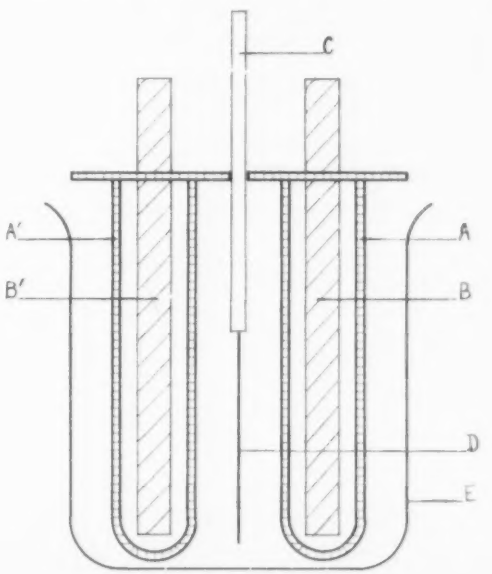

Fig. 3. Detinning cell.

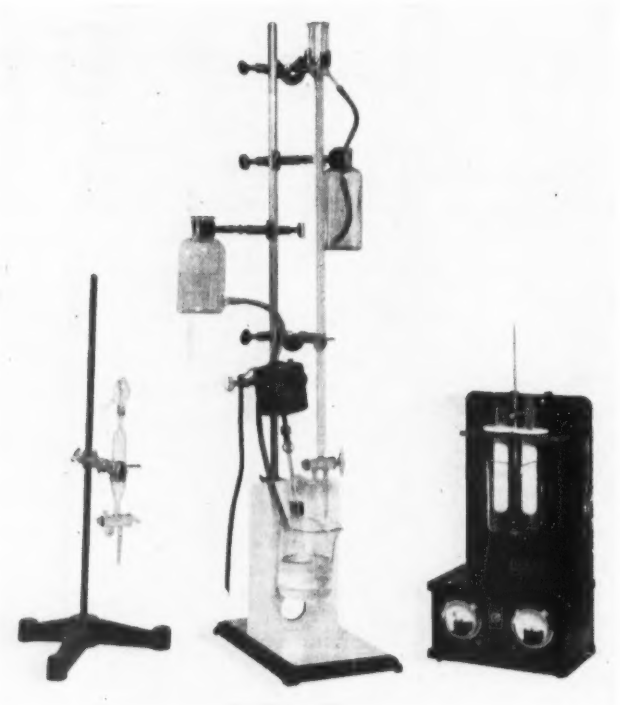

Fig. 4. Detinning cell.

rately to 3 amperes, but it has been found by experience that this amperage will remove the tin about as rapidly as titrations can be made. As a source of current an 8-volt storage battery, a direct current motor generator, or a dry rectifier transformer is satisfactory.

REAGENTS REQUIRED. *Hydrochloric Acid.* Dilute C. P. hydrochloric acid, with seven times its volume of distilled water. (Tap water may be used, providing it is free from objectionable oxidizing or reducing substances.)

Iodate-Iodide Solution. Dissolve 50 grams of potassium iodate, 280 grams of potassium iodide, and 0.1 gram of sodium hydroxide in 18 liters of distilled water.

Sodium Thiosulfate. Dissolve 365 grams of sodium thiosulfate pentahydrate in 18 liters of distilled water and add 2.5 grams of sodium carbonate.

Weaker solutions are preferable for lightweight coatings, 0.5 pound per base box or less.

PROCEDURE. Introduce 200 ml. of 1 to 7 hydrochloric acid and about 20 ml. of the iodate-iodide solution, accurately measured, into the 400-ml. beaker. Suspend the 4-square-inch tin plate sample from the magnet and immerse the electrodes in the beaker. Immersion of the electrodes in the beaker completes the electrical circuit. Allow a current of 3 amperes to flow for 2 to 5 minutes, remove the beaker, and titrate the remaining iodine with thiosulfate with starch as an indicator.

CALCULATIONS. The weight of tin coating for samples having an area of 4 square inches per side may be calculated stoichiometrically as follows:

$$(V_{KIO_3} \times N_{KIO_3} - V_{Na_2S_2O_3} \times N_{Na_2S_2O_3})\ 118/2 \times 17.28 = \text{pounds of tin per base box}$$

N = normality
V = volume in liters.

Where a large number of determinations are to be made, it is convenient to construct a table or curve which gives directly the tin coating corresponding to various thiosulfate titrations.

Discussion of Results

EFFECT OF TIME OF ELECTROLYSIS. In Figure 5 the percentage of recovery of tin is plotted against the time of cell operation. To obtain the data for these curves the tin coatings on 4-square-inch disks were determined by the electrolytic stripping procedure. The Sellars method was used to determine the tin coating on the annular areas immediately surrounding the disks. Percentage recoveries were calculated on the assumption that the Sellars method gave the true tin coating.

The curves show that the tin is stripped rapidly. Following this, the curve becomes practically horizontal, although it slopes slightly upward, as a result of reduction of iodine by ferrous iron as predicted by Figure 1. A negligible error will be obtained if the cell is not operated for more than 4 to 5 minutes, which is greatly in excess of the stripping time conveniently used in making routine determinations. Because the slope of the top portion of the curve is dependent upon

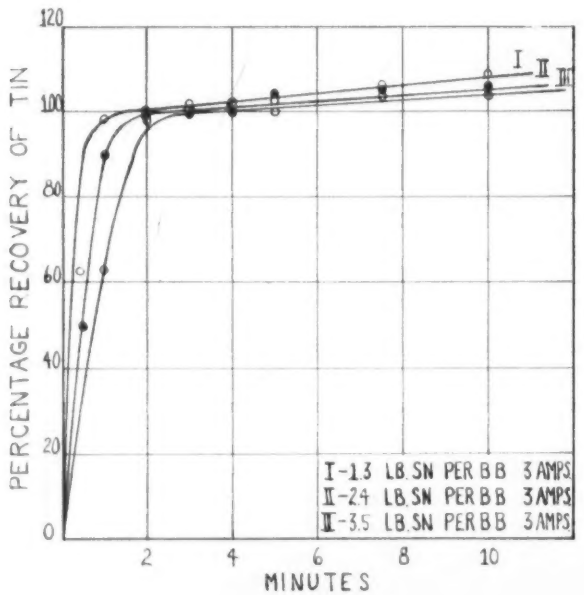

Fig. 5. Recovery of tin.

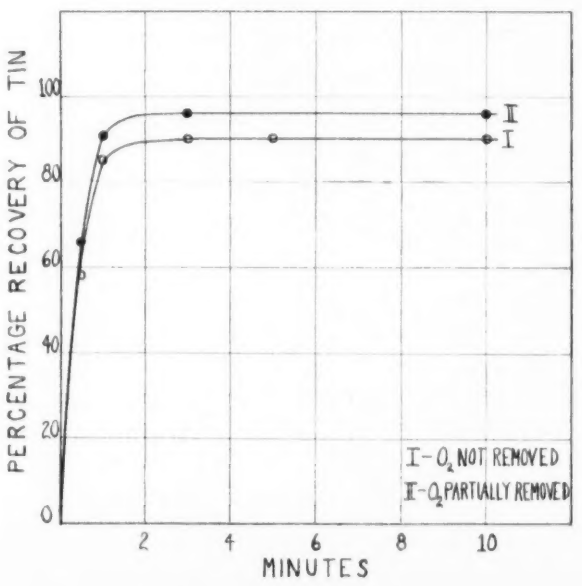

Fig. 6. Air oxidation.

the concentration of iodine at the end of the determination, it is desirable not to use a large excess of iodine.

Effect of Acid Concentration. The effect of acid concentration in the cell was investigated between concentrations 1 to 20 and 1 to 4. Below a concentration of 1 to 10 the stripping is incomplete and erratic results are obtained.

Effect of Air Oxidation. The procedure as outlined could be simplified somewhat if stannous tin were stable toward air-oxidation, since it would then be possible to make the electrolysis without the presence of iodine and titrate it directly with standard iodate-iodide. To demonstrate the magnitude of air-oxidation, curves shown in Figure 6 were constructed. The data of these curves were obtained by the regular procedure, except that instead of having iodine present during the electrolysis, the solution was titrated with iodate-iodide to a starch end point after the electrolysis.

In curve II, Figure 6, boiled hydrochloric acid was used and the recoveries approach more nearly 100 per cent, since less oxygen was present. In a few other cases almost 100 per cent recovery was obtained by covering the boiled hydrochloric acid with a layer of toluene, thereby preventing solution of oxygen during the determination.

From these curves it is clear that unless an excess of iodine is maintained throughout the electrolysis low results will be obtained.

Accuracy. The accuracy of the procedure may be judged from the curves in Figure 5 and from Table I, in which the results obtained by the electrolytic stripping method are compared with those obtained by the Sellars method, as found by another laboratory. Four-square-inch disks were used for the electrolytic method and adjoining annuli for the Sellars method.

Since the introduction of electrodeposited tin coatings, considerably lighter tin coatings have been encountered. For such coatings (0.5 pound or less per base box) the electrolytic stripping determination is better than the Sellars method, which is always subject to errors resulting from iodine-consuming constituents of the base metal which are necessarily titrated with the tin. For this reason Sellars iodate solutions are standardized against pure tin to which have been added approximately 4 square inches of typical untinned base metal. This procedure is entirely adequate

Table I. Comparison of Sellars and Electrolytic Methods

Sample	*Electrolytic*	*Sellars*	*Difference*
	Pounds of tin per base box		
1	2.02	2.02	0.00
2	2.03	2.03	0.00
3	2.10	2.10	0.00
4	1.58	1.58	0.00
5	1.95	1.94	+0.01
6	1.48	1.48	0.00
7	1.70	1.70	0.00
8	1.52	1.54	—0.02
9	1.99	2.01	—0.02
10	2.07	2.03	+0.04
11	1.83	1.85	—0.02
12	1.42	1.33	+0.09
13	2.15	2.13	+0.02
14	1.50	1.53	—0.03
15	1.59	1.61	—0.02

Table II. Comparison of Methods

Sample	*Sellars*	*$SbCl_3$ Stripping*	*$SbCl_3$ Stripping Corrected*	*Plumbite Stripping*	*Electrolytic*
	Pounds of tin per base box				
1	0.43	0.46	0.44		0.43
	0.43	0.46	0.45		0.45
	0.42				0.44
2	0.43	0.45	0.45	0.43	0.42
	0.42	0.46	0.45	0.44	0.42
3	0.43	0.45	0.44	0.43	0.43
	0.43	0.44	0.44	0.43	0.42
4	0.45	0.46	0.45	0.44	0.43
	0.44	0.47	0.45	0.45	0.44

when the amount of iodine required by the base metal is constant and small compared with that consumed by the tin; but when lightweight coatings are determined the Sellars method is accompanied by an appreciable error if the iodine-consuming properties of the base metal are not accurately taken into account.

Table II shows a comparison of the Sellars, electrolytic stripping, and chemical stripping methods.

In the case of the Sellars method the iodate solution was standardized against pure tin, to which had been added 4 square inches of the same base metal found in the samples. In the electrolytic stripping method the strength of the titrating solutions was reduced to one fifth that of the regular procedure. The stripping solutions consisted of 1 per cent antimony trichloride in 20 per cent hydrochloric acid in one procedure and a solution 5 per cent with respect to lead acetate and sodium hydroxide in another. In the case of the acid stripping solution, the results have been corrected for the loss in weight due to solution of iron during the stripping. No such correction was necessary in the case of the alkaline stripping solution. Samples for data shown in Table II consisted of strips of commercial electrodeposited tin plate. These were taken in a direction parallel to passage through the plating tank, so that the tin coatings of specimens taken for the various methods should be essentially constant.

The results given in Table II show satisfactory agreement between the various methods, although antimony trichloride stripping gives slightly high results. The agreement between the Sellars and electrolytic stripping would not be expected to be so good if the iodine-consuming properties of the base metal had not been accurately taken into consideration.

Acknowledgment

The authors wish to express their appreciation to Mr. W. C. Burfisher of the Wilkens-Anderson Company for assistance in designing the stripping unit shown in Figure 4. (This equipment is offered for sale by the Wilkens-Anderson Company, 111 North Canal St., Chicago, Ill.)

Literature Cited

(1) Buser, J. S., U.S. Patent 2,206,026 (1940).

(2) Clarke, S. G., International Tin Research and Development Council Publication, *Series A*, No. 12 (1934).

(3) Hoare, W. E., *Ibid.*, No. 14, p. 5 (1934).

(4) "Scott's Standard Methods of Chemical Analysis", 5th ed., Vol. II, p. 966, New York, D. Van Nostrand Co., 1939.

THIS IS WASHINGTON–

By George W. Grupp
METAL FINISHING's Washington Correspondent

Advertising in War and Peace The Department of Commerce issued on September 27, 1943, a 96-page, illustrated booklet on "Advertising and Its Role in War and Peace". This informative booklet places the federal government on record as favoring the maintenance of advertising schedules in all media as a constructive contribution to the war effort. This booklet is a compilation of the expressed attitude of President Roosevelt and other high government officials toward advertising in the present national emergency. A copy of the booklet may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or to any of the department's field offices.

Alien Employment Applications Speeded Up The War Department announced on October 4, 1943 that the approval of applications for the employment of aliens on vital contracts can now be given within a period of two days instead of four weeks. The War Department pointed out that "there is no restriction, generally, against the employment of aliens, regardless of whether they are from allied, neutral or enemy nations. It is required, however, that the employer first secure consent of the Secretary of War and the Secretary of the Navy before he may employ an alien on aeronautical contracts of the two departments which are classified as secret, confidential and restricted."

Cadmium Situation Discussed by Promisel Nathan E. Promisel, chief metallurgist of the Navy Department's Bureau of Aeronautics, on October 16, 1943 addressed the Baltimore-Washington Branch of the AES on the subject of "The Cadmium Situation and the Use of Zinc as a Substitute". A large number of the members turned out to hear Mr. Promisel deliver himself on this timely subject because cadmium is considered one of the most critical of materials during the present international situation. In the course of his talk, he spoke of the causes of confusion in finding a substitute for cadmium, the distribution of cadmium for war uses, the increasing spread between cadmium production and needs, the possible wastage of cadmium by some platers, the practical applications and limitations of cadmium, zinc and lead plating, the labor and equipment requirements for zinc and cadmium plating, and the elements of conversion procedure from cadmium to zinc plating. According to Mr. Promisel, the government will soon publish two bulletins which will be of special interest to platers. One will be a general informational bulletin, and the other will deal with the permissible applications of cadmium plating.

Chemical Laboratory Reagent Ratings The preference ratings on deliveries of reagent chemicals for laboratory uses were reassigned in Preference Rating Order P-135, as amended September 28, 1943. The preference rating of AA-1 has been assigned to deliveries of any reagent chemical to a laboratory which has a serial number under Preference Rating Order P-43 which governs laboratory equipment. Preference rating AA-2 has been assigned to deliveries of any reagent chemical to a laboratory lacking a serial number under Order P-43.

Chromium and Nickel Restrictions Limitation Order L-128, as amended September 18, 1943, provides that the use of chromium and nickel is restricted in the making of automotive intake and exhaust valves. However, intake and exhaust valves for military services are exempt from the restrictions of the order.

Primary Chromium Chemicals Under Control Primary chromium chemicals (which are used in pigment manufacture, chromic acid manufacture, surface treatment of metals, chromium plating and for metal alloys), were placed under allocation control by the WPB through the issuance of Supplementary Order M-18-b, as amended September 16, 1943. "Exemption from authorization is provided for acceptance of delivery in any month of not more than 100 pounds of any prime chromium chemical. A consumer or dealer, however, must submit to each supplier a certificate as provided in M-18-b, as amended, in order to accept delivery without specific authorization in any month of an aggregate quantity of primary chromium chemicals not exceeding the following: 4,000 pounds of sodium bichromate or its equivalent in chromium tanning compounds, 500 pounds of sodium chromate, potassium bichromate, potassium chromate and ammonium bichromate, and 800 pounds of chromic acid."

CMP Regulation No. 1 Revised The small order procedure was revised in CMP Regulation No. 1 on October 5, 1943. The definition of the term "small order" has been modified to include the delivery of orders for Class A products placed with manufacturers where the amount of controlled material required to fill the order does not exceed 300 pounds of copper and copper base alloys, or 500 pounds of aluminum, or 3 tons of carbon steel or 1,200 pounds of alloy steel. In placing small orders, persons do not have to make allotments. In other words, they do not have to show any allotment number or quarterly designation on their orders.

Contract Cancellation Methods Because battle experiences have made it necessary to cancel some contracts, the War Department announced on September 28, 1943 it has worked out "a streamlined method for making payments" on such contract cancellations. Brigadier General Albert J. Browning, director of the Purchases Division, Army Service Forces, said that three things are required to achieve adequate financing of contract cancellations. "First, interest must be allowed on the termination settlements to equalize the positions of contractors who use private financing rather than public. Second, the type of financing must be extremely simple. Third, the method must permit advancing of money against inventory, receivables, work in process and payments to the tier of contractors immediately below."

Directive 13 to CMP Regulation No. 1 Revoked The War Production Board revoked Directive 13 to CMP Regulation No. 1 on October 9, 1943. This action was taken because prime and secondary consumers are no longer required to submit complete bills

of materials according to Supplement No. 1 issued on September 25, 1943.

Advantages of Depreciation Knowledge With a knowledge of depreciation and other phases of metal finishing costs, the owners of shops can quote prices which will put their businesses on the profit side of the road. And a complete knowledge of depreciation will make it possible for them to take full advantage of their legally allowable depreciation deductions for income tax purposes.

Kinds of Depreciation As in any other business, the property of the metal finishing industry is subject to three kinds of depreciation. Physical depreciation is due to deterioration as evidenced by decay and wear and tear. Functional depreciation is due to inefficiency as evidenced by antiquated equipment, excessive or inadequate capacity and faulty layout. Economic depreciation is due to extraneous conditions as evidenced by changes in services, legislation, and regulations.

Causes of Depreciation The causes of depreciation as just indicated are (1) ordinary, and abnormal, wear and tear from usage, (2) unusual damage or deterioration due to accidents and exposure to the elements, (3) exhaustion, (4) limited use possibilities, (5) inadequacy, (6) obsolescence, (7) stoppage of demand for a particular metal finishing service, (8) negligence, (9) structural defects, (10) decrepitude, and (11) statutory requirements.

Life Expectancy and Depreciation Rate In determining the rate of depreciation the life expectancy of metal finishing units must be estimated. Unfortunately, the precise service life of a particular piece of equipment cannot be foretold because of unpredictable obsolescence, possible future abnormal usage, and the maintenance and repair policy. The best one can do is to estimate the service life of a unit premised on past experiences, just as the life insurance companies estimate the life of a particular policy holder from their average experience with groups of 100,000 persons.

Annual Depreciation Base Amount Having estimated the life expectancy of a unit of equipment, the next step is that of estimating the total depreciable amount. This amount is made up of the first cost of the unit plus transportation charges, plus the cost of installation, plus the cost of removing an old unit if the new one be a replacement, plus the estimated maintenance, (not repairs), to arrest deterioration, minus the estimated scrap value. For the sake of clarity, here is a hypothetical example.

First cost of new unit	$2,000
Freight charges	50
Installation costs	100
Estimated maintenance costs during life expectancy of the unit	1,000
Cost of removing the old unit	25
Total cost	$3,175
Estimated scrap value of new unit at end of service life	100
Amount to be depreciated	$3,075

Depreciation Methods In writing off a depreciable asset, the annual amount may be determined by either mathematical or non-mathematical methods. The principal non-mathematical methods are known as (1) the production method, (2) the revenue method, (3) the appraisal method, (4) the amortization method, (5) the replacement method, (6) the renewal expense method, (7) the retirement expense method, and (8) the retirement reserve method. The principal mathematical methods are (1) the unit cost method, (2) the equal annual payment method, (3) the annuity method, (4) the sinking fund method, (5) the reducing balance method, and (6) the straight line method.

Depreciation Tables It is impossible to describe each of these methods within the limited space of this department in one issue of *Metal Finishing*. However, a comparative table is presented showing the results of the sinking fund, straight line, and reducing balance methods.

COMPARATIVE DEPRECIATION TABLE OF A $600 UNIT WHICH HAS A TWENTY-YEAR LIFE EXPECTANCY AND A SCRAP VALUE OF $100

Age	Sinking Fund Method (6% interest)		Straight Line Method (no interest)		Reducing Balance Method (6% interest)	
	Book Value	*Annual Charge*	*Book Value*	*Annual Charge*	*Book Value*	*Annual Charge*
0	$600.00		$600.00		$600.00	
1	$586.40	$13.60	$575.00	$25.00	$548.52	$51.48
2	572.00	14.40	550.00	25.00	501.56	46.96
3	556.74	15.26	525.00	25.00	458.58	42.98
4	540.54	16.20	500.00	25.00	419.28	39.30
5	523.40	17.14	475.00	25.00	383.34	35.94
6	505.20	18.20	450.00	25.00	350.48	32.86
7	485.92	19.28	425.00	25.00	320.44	30.04
8	465.50	20.42	400.00	25.00	292.98	27.46
9	443.84	21.66	375.00	25.00	267.88	25.10
10	420.86	22.98	350.00	25.00	244.94	22.94
11	396.52	24.34	325.00	25.00	223.96	20.98
12	370.72	25.80	300.00	25.00	204.78	19.18
13	343.36	27.36	275.00	25.00	187.24	17.54
14	314.36	29.00	250.00	25.00	171.20	16.04
15	283.64	30.72	225.00	25.00	156.54	14.66
16	251.06	32.58	200.00	25.00	143.14	13.40
17	216.52	34.54	175.00	25.00	130.88	12.26
18	179.94	36.58	150.00	25.00	119.66	11.22
19	141.14	38.80	125.00	25.00	109.40	10.26
20	100.00	41.14	100.00	25.00	100.00	9.40
Depreciation Reserve		$500.00		$500.00		$500.00
Scrap Value	$100.00		$100.00		$100.00	
		$600.00		$600.00		$600.00

Depreciation Accounts For accounting purposes, depreciation charges may be set up as (1) classified depreciation accounts, (2) itemized depreciation accounts, (3) group depreciation accounts, and (4) composite depreciation accounts. In composite accounts a single composite rate of depreciation is written off covering all depreciable assets. In group depreciation accounts all depreciable assets of a similar kind and about the same useful lives are placed into a group. In the itemized depreciation accounts system, a separate account is kept for each unit of property. This is a very costly method and not entirely satisfactory. In the classified depreciation accounts method, the depreciable assets are segregated into class groups such as (a) buildings, (b) machinery and equipment, (c) office furniture and fixtures, and (d) transportation vehicles.

Depreciation Records Irrespective of the method used, each depreciation account should show (1) the estimated life expectancy of the unit or units, (2) the rate of depreciation, (3) the date of acquisition of the unit or units, (4) the original cost of the unit or units, (5) the cost of additions, (6) the retirement credits, (7) the cost at the end of the year, (8) the annual depreciation accrual, (9) the charges to accrued depreciation for sales and retirements, and (10) the net depreciation reserve at the end of the year.

End-Use Must Not Be Traced

Interpretation No. 18 to CMP Regulation No. 1, issued on September 14, 1943, states that a person operating under the Controlled Materials Plan "must not, in any case, attempt to trace the ultimate end-use of his product for the purpose of filling out Section A of Form CMP-4B."

Facilities Committee's Policy

The Facilities Committee of the War Production Board on September 30, 1943 issued this statement of policy: "It shall be the continued policy of the War Production Board to restrict construction of new facilities and to reduce facilities under construction to the minimum necessary for the war program and for essential civilian needs, in order to conserve to the utmost all resources for the production of war supplies and equipment. In accomplishing this result, the Board will in each case seek a minimum consumption of materials and manpower, together with maximum utilization of existing facilities and equipment. The Directive for Wartime Construction dated May 20, 1942, which established these principles is hereby affirmed."

General Inventory Order M-161 Amended

General Inventory Order M-161, as amended September 30, 1943, removed from Schedule A silicate of soda, sodium carbonate and sodium hydroxide.

Idea Exchange Should Be Used

Readers of *Metal Finishing* should not neglect to use the services of the Suggestion Exchange Section, War Productive Drive Headquarters, War Production Board, Washington, D. C. Periodically, this section publishes "Informative Technical Bulletin" which gives a brief outline of hundreds of ideas. If anyone can use one of the ideas, the section provides the interested person with a sketch, blue print or photograph, as well as full descriptions with necessary specifications for the utilization of it. Recently the section released "Informative Technical Bulletin No. 5."

Laboratory Equipment Control Eased

The WPB eased its control over the distribution of laboratory equipment by amending Order L-144 on October 9, 1943. No authorization is now required for items on List A on distributors' purchase orders. The amended order puts distributors located in Canada on the same basis as those located in the United States. The amended order points out that List A does not include second hand equipment or parts for maintenance and repair of existing equipment.

Loans to Small Business Men

Albert M. Carter, acting chairman and executive director of the Smaller War Plants Corporation, announced on October 18, 1943 that the corporation has established a new loan system, effective November 1, 1943. Under this new plan the regional loan agents of SWPC will enter into agreements up to 100 per cent with banks on loans of $25,000 or less where the banks agree to close and service the loan for small business concerns. The interest rate shall be four per cent on that part of the loan which is carried at the risk of the SWPC with the banks paying one per cent per annum as a repurchase charge to SWPC. Under the new plan the small business man makes an application for a loan of $25,000 or less to the local agent of the SWPC. If the applicant meets the requirements, he will then be asked to designate a specific bank in his community from whom he would like to make the loan. The applicant and the SWPC agent then go to the bank to arrange for the loan upon which the SWPC enters into a repurchase agreement up to 100 per cent.

Nickel Plating for Goggles

Limitation Order L-114, as amended September 20, 1943, provides that copper base alloy, nickel silver and nickel plating may be used in slip-over type industrial safety spectacles. Nickel plating for spectacle type goggles, previously permitted only until November 30, 1943, is permitted without expiration date. It was expected that a suitable substitute for nickel plating would be developed by November 30, 1943 but manufacturers have been unable to find one in spite of extensive efforts.

Oxidized Petrolatum Under Control

On November 1, 1943 oxidized petrolatum was placed under allocation by amending Miscellaneous Chemicals Order M-340 on October 9, 1943. Oxidized petrolatum, which is used as a rust preventive and corrosion inhibitor, is produced by only one company. Research to develop new sources is being pressed but none has been found thus far.

Preference Rating Order Amended

On September 29, 1943 Preference Rating Order P-89 (which governs maintenance, repair, and operating supplies), was amended to conform to Priorities Regulation No. 3. The amended order adds a new sub-paragraph to paragraph (g) so that the lists attached to Priorities Regulation No. 3 will limit the use of P-89 ratings. It also provides a flat AA-1 rating and allotment symbol, MRO-P-89 for usage after January 1, 1944 with the restraining provision that the aggregate dollar value of purchase orders in 1944 will not exceed those in 1943.

"Products and Priorities" Makes Its Appearance

A new publication, "Products and Priorities", designed to aid business men and government officials in obtaining information on all products, materials, and services handled by the War Production Board, made its appearance during the past month. This new publication is a merging of the publications known as "Priorities" and "Product Assignments". A year's subscription to 13 issues of this new publication may be had for $2.00 from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Single copies cost 20 cents each.

Sodium Metasilicate to Be Under Allocation Control

At a meeting of sodium metasilicate manufacturers held in Washington early in October, plans were discussed to place this chemical under allocation distribution control about the first of November. It was learned that this allocation order will be similar to the phosphate allocation order. It is possible that consumers requiring less than 800 pounds per month on an anhydrous basis will not be required to state end uses.

Steel Drum Critical Situation

On September 28, 1943 the War Production Board announced that a critical situation will develop in steel shipping drums during the fourth quarter of 1943. This condition is said to be due to a suddenly increased demand from several claimant agencies of the government. Because of this impending situation, a study is being made of possible substitutes. As a result of this shortage, Order L-197 was amended and Order M-255 was revoked to give the WPB more positive control over the distribution of steel shipping drums.

WPB Field Offices' Functions Expanded

Operations Vice Chairman H. G. Batcheller of the WPB ruled on September 24, 1943 that the board's field offices are now permitted to process PD-1A applications and most industrial project applications under $10,000 and that after January 15, 1944 this will be increased to $25,000; that they may process PD-333 emergency assistance applications up to $500 until October 24, 1943, to $1,000 during the next thirty days, and to $2,500 after November 25, 1943. and that they may process appeals under WPB "L" and "M" orders.

Dictionary of Metal Finishing Chemicals

This is the eleventh consecutive installment of the alphabetical listing of chemicals used in electroplating.

Lead Protoxide: See Lead Oxide, Yellow.

Lead, Red: See Lead Oxide, Red.

Lead Sesquioxide: Pb_2O_3. Mol. wt. 462.44. Reddish yellow amorphous powder. Decomposes when heated. Insoluble in water. Decomposes in acids. Soluble in alkalis. Grades: Technical. Containers: Bottles; Tins (1, 5 lb.); Kegs (100 lb.).

Lead Subcarbonate: See Lead Carbonate, Basic.

Lead, Sugar of: See Lead Acetate.

Lead Sulfate: $PbSO_4$. Mol. wt. 303.27. Sp. gr. 6.2. White, rhombic or monoclinic crystals or powder. Decomposes when heated. Insoluble in water. Soluble in concentrated sulfuric acid, ammonium salt solutions. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Boxes (25 lb.); Kegs (100 lb.); Barrels (500 lb.).

Lead Sulfide: PbS. Mol. wt. 239.27. Sp. gr. 7.5. M. P. 1110°C. Cubical, black, metallic crystals or black powder. Insoluble in water. Soluble in acids. Grades: Technical, C. P., Purified. Containers: Bottles; Cartons (1, 5 lb.); Barrels.

Lead Superoxide: See Lead Oxide, Brown.

Lead White: See Lead Carbonate, Basic.

Lime: See Calcium Oxide.

Lime, Air Slaked: A white powder consisting of a mixture of calcium carbonate and calcium hydroxide formed by the absorption of carbon dioxide from the air.

Lime, Burnt: See Calcium Oxide.

Lime, Chloride of: See Calcium Hypochlorite.

Lime, Chlorinated: See Calcium Hypochlorite.

Lime, Salts of: See Calcium Salts.

Lime, Hydrate: See Calcium Hydroxide.

Lime Hydrated: See Calcium Hydroxide.

Lime, Liver of: See Calcium Sulfide.

Lime, Slaked: See Calcium Hydroxide.

Lime Sulfurated: See Calcium Sulfide.

Lime Unslaked: See Calcium Oxide.

Lime Vienna: A high magnesia lime used for mild detergent purposes. White powder. Grades: Technical. Containers: Boxes; Tins (1, 5, 10, 25 lb.); Kegs (100, 125 lb.); Drums (250 lb.).

Lime Water: Solution of calcium hydroxide in water.

Limestone: Rock composed mainly of calcium carbonate.

Liquid Ammonia: See Ammonia, Anhydrous.

Litharge: See Lead Oxide, Yellow.

Lithium: Li. At. wt. 6.940. Sp. gr. 0.534. M. P. 186°C. B. P. 1336°C. Cubical, silver white, soft metal. Decomposes water with liberation of hydrogen. Soluble in acids. Grades: Technical. Containers: Glass bottles filled with kerosene (1, 10, 25 g.).

Lithium Chloride: LiCl. Mol. wt. 42.397. Sp. gr. 2.07. M. P. 613°C. B. P. 1353°C. Cubic, white, deliquescent crystals. Solubility, 67 at 0°C. and 127 at 100°C. Slightly soluble in alcohol. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.).

Litmus: A blue amorphous powder or blue cubes derived from lichen processing. Soluble in water. Grades: Technical, C. P. Containers: Bottles; Cartons (1, 4, 16 oz.).

Litmus Paper: Paper dipped in litmus solution.

Liver of Lime: See Calcium Sulfide.

Liver of Sulfur: See Potassium, Sulfurated.

Lunar Caustic: Fused Silver Nitrate, q. v.

Lye: See Sodium Hydroxide and Potassium Hydroxide.

Magnesia: See Magnesium Oxide.

Magnesia, Burnt: See Magnesium Oxide.

Magnesia, Calcined: See Magnesium Oxide.

Magnesite: See Magnesium Carbonate.

Magnesium: Mg. At. wt. 24.32. Sp. gr. 1.74. M. P. 651°C. B. P. 1110°C. Hexagonal, silvery white metal. Very light. Malleable. Insoluble in cold water. Slightly decomposed by hot water. Soluble in acids and ammonium salt solutions. Grades: Technical powder, ribbons, rods, turnings, wire. Containers: Cans (1, 5 lb.).

Magnesium Carbonate: $MgCO_3$. Mol. wt. 84.33. Sp. gr. 3.04. White crystals or lumps. Also known as Magnesite. Decomposes when heated. Insoluble in water. Soluble in acids. Grades: Technical lumps; burnt, or calcined powder. Containers: Bottles, Cartons (1, 5 lb.); Bags; Barrels; Kegs, Bulk.

Magnesium Carbonate, Basic: See Magnesium Carbonate, Heavy.

Magnesium Carbonate, Heavy: $3MgCO_3 \cdot Mg(OH)_2 \cdot 3H_2O$. Mol. wt. 365.37. Sp. gr. 2.16. Rhombic, white crystals or white powder. Also known as Basic Magnesium Carbonate. Decomposes when heated. Insoluble in water. Soluble in acids and solutions of ammonium salts. Grades: Technical, U. S. P., C. P. Containers: Bottles, Cartons (1, 5 lb.); Kegs (50 lb.); Bags (50, 100 lb.); Barrels (150 lb.).

Magnesium Carbonate, Light: $MgCO_3 \cdot 3H_2O$. Mol. wt. 138.38. Sp. gr. 1.85. Colorless, rhombic needles or white powder. Decomposes when heated. Insoluble in water. Soluble in acids. Grades: Technical, U. S. P., C. P. Containers: Bottles (1 lb.); Cartons (1, 5, 50 lb.); Kegs (30, 35 lb.); Bags (50, 100 lb.); Barrels (65, 70 lb.).

Magnesium Chloride: $MgCl_2 \cdot 6H_2O$. Mol. wt. 203.33. Sp. gr. 1.56. Colorless, monoclinic, deliquescent crystals or flakes. Decomposes when heated. Solubility, 167 in cold water and 367 in hot water. Soluble in alcohol. Grades: Technical, N. F., C. P. crystals or fused lumps (partially dehydrated). Containers: Bottles (1, 5 lb.); Boxes (25 lb.); Kegs, Bags (100 lb.); Drums (100, 300, 350, 575, 700 lb.); Barrels (600, 900 lb.).

Abbreviations: Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

Magnesium Hydrate: See Magnesium Hydroxide.

Magnesium Hydroxide: $Mg(OH)_2$. Mol. wt. 58.34. Sp. gr. 2.4. Colorless crystals or white powder. Also known as Magnesium Hydrate. Decomposes when heated. Insoluble in water. Soluble in acids and solutions of ammonium salts. Grades: Technical, Medicinal. Containers: Bottles, Cans (1, 5 lb.); Barrels.

Magnesium Oxide: MgO. Mol. wt. 40.32. Sp. gr. 3.22. M. P. 2800°C. Heavy or light white powder. Also known as Magnesia, Light Magnesia (from Light Magnesium Carbonate), Heavy Magnesia (from Heavy Magnesium Carbonate), Calcined Magnesia. Insoluble in water. Soluble in acids and solutions of ammonium salts. Grades: Technical, U. S. P., C. P. Containers: Bottles, Cartons (1, 5 lb.); Cans (1, 5, 25, 50 lb.); Boxes (25, 50 lb.); Kegs (50, 100 lb.); Barrels (50, 175, 550 lb.); Cases (80 lb.); Drums (100, 200 lb.).

Magnesium Oxide, Heavy: See Magnesium Oxide.

Magnesium Oxide, Light: See Magnesium Oxide.

Magnesium Sulfate: $MgSO_4 \cdot 7H_2O$. Mol. wt. 246.49. Sp. gr. 1.68. Colorless crystals. Also known as Epsom Salt. Loses water of crystallization when heated to form a white powder containing a variable amount of water. Solubility, 71 at 20°C. and 91 at 40° C. Soluble in alcohol and glycerin. Grades: Technical, U. S. P., C. P. crystals; Technical, Purified and C. P. dried and anhydrous powder. Containers: Bottles, Cartons (1, 5 lb.); Boxes (10, 25, 50 lb.); Kegs (100, 112, 125 lb.); Bags, Drums (100 lb.); Kegs (125 lb.); Barrels (200, 225, 250, 300, 325, 350, 400, 440 lb.).

Magnetite: See Ferric Oxide, Black.

Malachite, Artificial: See Copper Carbonate, Basic.

Manganese: Mn. At. wt. 54.93. Sp. gr. 7.20. M. P. 1260°C. B. P. 1900° C. Cubic or tetragonal pinkish gray metal. Decomposes in water. Soluble in dilute acids. Grades: Technical, Carbon Free. Containers: Cans, Boxes (1, 5 lb.).

Manganese Ammonium Sulfate: $MnSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$. Mol. wt. 391.23. Sp. gr. 1.83. Monoclinic pink crystals. Solubility, 51 at 25°C. Very soluble in hot water. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.).

Manganese Binoxide: See Manganese Dioxide.

Manganese Carbonate: $MnCO_3$. Mol. wt. 114.94. Sp. gr. 3.125. Rose pink crystals or amorphous light brown powder. Also known as Manganous Carbonate. Decomposes when heated. Insoluble in water. Soluble in dilute acids. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Cans (25 lb.).

Manganese Chloride: $MnCl_2 \cdot 4H_2O$. Mol. wt. 197.91. Sp. gr. 2.0. M. P. 58°C., losing water of crystallization. B. P. 106°C. Monoclinic, rose colored deliquescent crystals. Also known as Manganous Chloride. Solubility, 151 at 8°C. and 656 at 100°C. Soluble in alcohol. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Boxes (25 lb.); Kegs (100 lb.); Barrels (550 lb.); Casks (600, 700 lb.).

Manganese Dioxide: MnO_2. Mol. wt. 86.93. Sp. gr. 5.03. Rhombic, black crystals or brownish black powder. Lumps or black powder in the native form. Also known as Manganese Binoxide, Manganese Peroxide, Manganous Peroxide. Decomposes when heated to 535°C. losing one atom of oxygen. Insoluble in water and nitric acid. Soluble in hydrochloric acid. Grades: Technical, C. P. Containers: Bottles, Cartons (1, 5 lb.); Boxes (25, 50, 100 lb.); Kegs (100 lb.); Drums (100, 400 lb.); Barrels (750, 1,000 lb.); Casks (800 lb.).

Manganese Peroxide: See Manganese Dioxide.

Manganese Sulfate: $MnSO_4 \cdot 4H_2O$. Mol. wt. 223.05. Sp. gr. 2.11. Monoclinic or rhombic pink efflorescent crystals; also anhydrous powder. Also known as Manganous Sulfate. Solubility, 105 at 0°C. and 111 at 50°C. Insoluble in alcohol. Grades: Technical, N. F., C. P., fine and coarse crystals. Containers: Bottles (1, 5 lb.); Boxes, Drums (25 lb.); Kegs, Bags (100 lb.); Barrels (375 lb.); Drums (550 lb.); Casks (600 lb.).

Manganous Carbonate: See Manganese Carbonate.

Manganous Chloride: See Manganese Chloride.

Manganous Peroxide: See Manganese Dioxide.

Manganous Sulfate: See Manganese Sulfate.

Mannite: See Mannitol.

Mannitol: $C_6H_8(OH)_6$. Mol. wt. 182.17. Sp. gr. 1.49. M. P. 166°C. B. P. 295°C. Colorless rhombic needles or white prisms. Also known as Mannite, d-Mannitol. Solubility, 16 at 20°C. Slightly soluble in alcohol. Grades: Technical, Purified. Containers: Bottles, Cartons (1 lb.); Boxes (1, 5 lb.).

Marble: A natural form of calcium carbonate or limestone, q. v.

Mercuric Biniodide: See Mercuric Iodide.

Mercuric Chloride: $HgCl_2$. Mol. wt. 271.52. Sp. gr. 5.42. M. P. 275°C. B. P. 301°C. Rhombic colorless crystals or white powder or granules. Also known as Corrosive Sublimate, Mercury Bichloride, Mercury Protochloride. Solubility, 7 at 20°C. and 61 at 100°C. Soluble in alcohol, ether, acetic acid and cyanide solutions. Grades: Technical, U. S. P., C. P., crystals and powder. Containers: Bottles (1, 5 lb.); Boxes (25 lb.); Drums (25, 100 lb.); Kegs (200-250 lb.).

Mercuric Cyanide: $Hg(CN)_2$. Mol. wt. 252.65. Sp. gr. 4.00. Tetragonal, colorless crystals or white powder. Also known as Mercury Cyanide. Decomposes when heated. Solubility, 9 at 14°C. and 53 at 100°C. Soluble in alcohol and glycerin. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Kegs.

Mercuric Iodide: HgI_2. Mol. wt. 454.45. Sp. gr. 6.28 (red); 6.27 (Yellow). Red is transformed to yellow on heating to above 135°C. The yellow melts at 259°C. and boils at 354°C. Red tetragonal crystals or powder and yellow rhombic crystals or powder. Also known as Mercuric Biniodide, Red Mercuric Iodide, Yellow Mercuric Iodide, Mercury Protoiodide. Very slightly soluble in water and in alcohol. Soluble in ether, solutions of sodium thiosulfate and solutions of potassium iodide. Grades: Technical, N. F., C. P. Containers: Bottles (1 lb.); Jars (10, 25 lb.); Kegs (100 lb.).

Mercuric Nitrate: $Hg(NO_3)_2 \cdot 2H_2O$. Mol. wt. 360.66. Colorless crystals or white deliquescent powder. Also known as Mercury Nitrate. Soluble in water and nitric acid solutions. Insoluble in alcohol. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Jars (10, 25 lb.); Kegs (100 lb.).

(To be continued next month)

Abbreviations: Mol. wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

Patents

Prevention of Silver Tarnish

U. S. Pat. 2,323,369. G. F. Briggmann, assignor to Carbide and Carbon Chemicals Corp., July 6, 1943. A method for protecting silver from tarnish which comprises exposing the silver in a confined space to the vapor of a volatile amine.

Example:

1% solution of morpholine in water. A small container of this solution is placed in the silver storage space.

Copper Coated Wire

U. S. Pat. 2,323,890. O. E. Adler, assignor to National-Standard Co., July 13, 1943. A copper coated article comprising a ferrous metal wire, a coating of a corrosion resistant metal of the class consisting of zinc, cadmium, lead and tin on the wire, said coating having a thickness between approximately 0.00004 and 0.0001 inch, a thin copper coating thereon having a thickness of less than approximately 1/60,000 inch and not less than 1/400,000 inch, the wire and coatings having been substantially reduced in cross-sectional area by drawing through a die, and the resulting wire having a corrosion resistance markedly greater than an undrawn wire having the same thickness of the metal of the class consisting of zinc, cadmium, lead and tin.

Plating Rack

U. S. Pat. 2,323,952. R. M. Wick, July 13, 1943. A plating cradle for cylindrical work wherein only one cylindrical surface is to be plated, comprising a separable circumferential metallic ring of a diameter to fit tightly against one cylindrical surface of the work, a framework for said ring including a pair of cathode bars on which said ring is mechanically supported and clamped against the work, insulating means holding said bars in spaced apart position and an anode bar supported by said insulating means between said cathode bars, and a conformed circumferential anode supported on said anode bar in juxtaposed position to the opposite cylindrical surface of the work.

Finishing Aluminum

U. S. Pat. 2,324,106. R. E. Pettit, assignor to Aluminum Co. of America, July 13, 1943. A method of ornamenting an aluminum surface which consists in providing said surface with contrasting sand blasted and relatively smooth areas, anodically treating said surface in a brightening electrolyte to brighten said contrasting areas and thereafter applying to said surface a protective coating of aluminum oxide by anodic treatment.

Sand Blasting

U. S. Pat. 2,324,250. J. N. Voerge (Canada). July 13, 1943. A sandblast apparatus, comprising, a body having an inlet end and an outlet end and a passage extending therebetween, a liner adapted for carrying sand and air removably mounted in said passage, a water jacket surrounding at least a portion of said body and having a flared portion adjacent said outlet forming a conical mouth, a frustro-conical plug connected to said body for axial movement in relation thereto, said plug being adapted to form with the flared mouth of said jacket a frustro-conical water discharge nozzle of adjustable width, a water communication to said jacket, and a communication to said liner for sand and air.

Anode

U. S. Pat. 2,324,342. H. G. Wellman, assignor to The Wellman Bronze and Aluminum Co., July 13, 1943. An anode for electroplating comprising a supporting member and a body member depending therefrom, said members being comprised of different alloys and having cooperating portions secured together and forming a joint therebetween, the alloys of which the members are comprised being such as, in combination with the plating bath, to maintain deleterious electrolytic action at the joint tending to weaken the supporting member, and means for preventing plating bath drip from above the joint contacting the latter consisting of an imperforate collar surrounding said joint and overhanging the body member at the joint, said collar having a downwardly sloped upper surface whose drip edge is extended throughout its periphery exteriorly of and free from contact with the portions of said members forming said joint, and said collar inwardly of its drip edge having sealing engagement in an unbroken and endless band with said supporting and body members.

Sand Blasting Machine

U. S. Pat. 2,324,425. J. W. Rasmussen, July 13, 1943. A sand blasting apparatus comprising a tank, a central tubular passage means in said tank, a set of cross pipes connecting the bottom section of said central passage means, a mixing chamber connecting the upper end of said central passage means and disposed upon the top section of said tank, a high pressure air conduit tube passing through said central passage means and terminating within the intake end of said mixing chamber, and an air conduit pipe connecting said high pressure air conduit tube including said central passage means and said tank, for supporting the air flow therethrough and for drawing and for forcing a quantity of sand through said mixing chamber.

Tarnish Prevention of Metals

U. S. Pat. 2,324,859. H. C. Macan, assignor to Anaconda Copper Mining Co., July 20, 1943. In the manufacture of sheet copper by electrodeposition from a suitable electrolyte, the method of protecting a surface of the electrodeposited sheet from discoloration which comprises washing and drying the surface of the sheet to be protected after withdrawal thereof from the electrolyte, and thereafter applying to the dry surface a coating of a volatile liquid hydrocarbon having good wetting properties and sufficiently volatile to evaporate quickly and completely from the sheet and carrying in solution from about 0.2 to 60 grams per liter of a wax capable of forming upon evaporation of volatile liquid an extremely thin and substantially imperceptible protective coating over the surface of the sheet, said wax coating having the property of receiving and bonding to an adhesive.

Manganese Plating

U. S. Pat. 2,325,068. J. J. McLaughlin, assignor to Chicago Development Co., July 27, 1943. The process of making alloys containing electrolytic manganese which includes the step of forming a composite sheet of the approximate composition of the alloy desired by electroplating manganese on a metal sheet and melting said composite sheet without separating the manganese from the original metal sheet.

Hot Dipping

U. S. Pat. 2,325,126. J. V. Giesler, assignor, by mesne assignments, to Reynolds Metal Co., July 27, 1943. In the method of producing relatively thick and uniform coatings of metal on strips or the like of base metal passed continuously through a molten bath of the coating metal, the steps of moving the strip being coated through the bath and out of the molten metal at a large angle on the order of a right angle to the surface of the bath and maintaining the strip within the molten metal at and adjacent to the surface thereof under a substantial vibration at an angle to the face of the moving strip so that the surface of the molten metal where the strip is withdrawn therefrom is kept under substantial agitation.

Hot Dipping Wire

U. S. Pat. 2,325,156. M. G. Whitfield, assignor to Reynolds Metal Co., July 27, 1943. The method of providing a wire with a relatively thick and substantially uniform coating which includes the steps of passing the wire through a bath of molten coating metal and establishing an uninterrupted wave in engagement with the wire where it emerges from the surface of the bath by continuously moving said wire at a relatively high speed in the same direction through a closed orbital path traced at the surface of the bath.

Pickling & Cleaning Machine

U. S. Pat. 2,325,158. F. J. Wood, assignor to Goodman Mfg. Co., July 27, 1943. In a continuous strip pickling and cleaning device a pair of aligned pickling troughs, through which a strip of metal is adapted to pass during the pickling operation, a plurality of settling tanks arranged beneath each of said pickling troughs, fluid pipes connecting said tanks together, valves in said pipes arranged to shut off the flow of fluid from any one of said tanks to any other of said tanks, other fluid pipes connecting said tanks with said pickling

troughs, valves in said pipes arranged to shut off the flow of fluid from any one of said tanks to any one of said pickling troughs, pumps for circulating fluid through said pipes from any one or more of said tanks to any other of said tanks and from any one or more of said tanks to any of said pickling troughs, a separate sewer extending along the ends and one side of each pickling trough for collecting the fluid discharged from its associated trough, connections between each sewer and the settling tanks associated with said trough, selectively operable to permit fluid to flow from said sewer to any one of its associated tanks.

Anode

U. S. Pat. 2,325,201. J. L. Young, assignor to Plastic Metals, Inc., July 27, 1943. A soluble anode for an electrolytic cell consisting of a coherent and porous mass of granules of substantially pure iron connected granule to granule by bridges of iron in metallic state and being thereby of high porosity and electrical conductivity, of high and maintained coherence in use whereby the iron is dissolved substantially completely under the influence of the electric current with substantially no disintegration and loss of particles of free iron.

Plating Circuit

U. S. Pat. 2,325,401. G. J. Hurlston, assignor to Carnegie-Illinois Steel Corp., July 27, 1943. Apparatus for electrolytically treating metal strip and wire work, including the combination of an electrolyte, equipment for passing said work continuously through said electrolyte at a varying traveling speed, a first electric circuit including said work and said electrolyte, electric powering means for said first circuit, a second electric circuit, means for obtaining an electric voltage in said second circuit proportional to the current in said first circuit, means for obtaining an electric voltage in said second circuit proportional to said traveling speed in opposition to the voltage obtained by the second named means and means responsive to the direction of the current flow in said second circuit for varying the output of said powering means, said combination further including adjustable means for varying the voltage obtained in said second circuit by at least one of said means for obtaining an electric voltage therein.

Buffing Machine

U. S. Pat. 2,325,622. E. E. Murray, August 3, 1943. The combination of an arm mounted for oscillation about a fixed axis, a tool holding spindle mounted in said arm parallel to said axis, a pulley concentric with said axis, a stationary motor support having a motor mounted thereon, means driving said pulley from said motor, means driving said spindle from said pulley, springing means supporting said arm against gravity at an angle with respect to the vertical, and springing means including the first named springing means opposing oscillation of said arm out of its selected position.

Manganese Plating

U. S. Pat. 2,325,660. H. L. Chamberlain, assignor to Electro Manganese Corp., August 3, 1943. A cathode adapted for the electrolytic deposition of a brittle metal thereon and the ready removal of said deposit therefrom, said cathode being in sheet form, having a substantially planar surface, sufficiently free from stresses to prevent warping, sufficiently resilient to permit flexing without permanent deformation, sufficiently inert to prevent substantial contamination of the electrolyte and manganese deposit, said cathode being an annealed, surface ground, cold rolled and surface polished alloy having the composition: chromium 17 to 19 per cent, nickel 11 to 13 per cent, molybdenum 2 to 4 per cent and the balance iron.

Polishing Machine

U. S. Pat. 2,325,701. E. E. Murray, August 3, 1943. A polishing machine including in combination, a universally adjustable plate, a motor mounted on one side of said plate, means on the opposite side of said plate for supporting a polishing wheel, means drivingly interconnecting said motor and said polishing wheel, an adjusting screw for varying the distance of said polishing wheel from said plate, and means for releasing said adjusting screw to permit rapid bodily movement of said polishing wheel with respect to the work, said last named means including a split nut adapted to be positioned in embracing relationship to said screw, one of the split sections of the nut being pivotally mounted with respect to the other section.

Cleaning Method

U. S. Pat. 2,325,957. C. J. Krogel, assignor to Western Electric Co., Inc., August 3, 1943. A method of cleaning the surface of a metallic article which comprises steps of immersing the surface to be cleaned in a bath comprising a water solution of an alkaline electrolyte and a foaming agent, and passing an alternating electric current through the bath between the article as one electrode and another electrode, the detonating gas liberated at the electrodes coacting with the foaming agent in the bath to form a foam on the bath in which both the gas and foreign matter released from the surface by the electrolytic action are entrapped to be harmlessly carried away.

Plating Apparatus

U. S. Pat. 2,326,624. H. Csanyi, assignor of one-half to Harry F. Wanvig, August 10, 1943. Electroplating apparatus comprising a tank for electrolyte having means in the side walls thereof for passing metal stock therethrough along a substantially horizontal path below the level of electrolyte therein, a cover for said tank completely enclosing the upper portion thereof, conduit means for carrying away fumes collecting under said cover, a plurality of anodes suspended in said tank from said cover in pairs at spaced intervals along the horizontal path of the stock and spaced substantially uniformly above and below said path, and means suspended from said cover and contacting the stock for removing gas from the surface of stock after it has passed between one pair of anodes and before it passes between another pair of anodes.

Plating Apparatus

U. S. Pat. 2,326,707. F. W. Thomas and R. D. Maclachlan, assignors to Crown Fastener Corp., August 10, 1943. Apparatus adapted for the continuous electroplating of electrically conducting articles including separable fasteners, said articles being secured in spaced relation on an electrically non-conducting carrier, said apparatus comprising an electrolytic cell having two chambers containing an anode and a cathode, respectively, said chambers being separated by a structure comprising a series of bipolar electrodes mounted for individual rotation about their axes and a series of insulating members alternately disposed in relation to said electrodes and in sliding contact therewith; means to rotate said cylinders whereby a portion of the surface of each cylinder is alternately in the anode chamber and is then negative in relation to the anode therein and in the cathode chamber and is then positive in relation to the cathode therein so that metal deposited on said cylinder in the anode chamber is stripped therefrom in the cathode chamber; and means to continuously pass said articles, mounted on said carrier, successively into contact with each of said cylinders to deposit metal from said electrolyte on said articles.

• HISTORICAL PATENTS •

Zinc as a Sacrificial Metal

Issued to John Revere on November 27, 1830, British Patent No. 6040 is entitled "A method of protecting iron chain cables, iron boilers and iron tanks, from the corrosion produced upon them by the action of water."

For protecting iron chain cables, a piece of zinc is attached to each link, and "in order to afford a convenient and safe place for the reception of the zinc protector, it is recommended that the brace, or stay, or stud should be made flat with a ridge on the edge. The zinc is applied by means of riveting or soldering, or both riveting and soldering to the previously well cleaned iron surface."

A zinc protector may be applied to one or each side of the stud; *it is desirable however, that the zinc plate or plates should present a surface which should bear a proportion to that of the whole link, at least, as five to one hundred.*

Pure zinc is preferred for the purpose of the invention but it is stated that "if the zinc be combined with small portions of other metals, as copper, iron, tin, lead, nickel or bismuth, its protecting power is not essentially diminished."

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING — BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Gold Restrictions

Question: On page 17 of the 1943 *Plating and Finishing Guidebook* I find the footnote which states that the "use of gold in the manufacture of jewelry by larger houses has already been partially restricted." It is my understanding that only the use of "Karat gold" has been restricted and this is because of the base metal content and not of any restrictions on gold per se. Inasmuch as this footnote appears in a plating handbook where the gold is usually of the 24-karat variety, at least when entering the solution, do you net feel that this statement is slightly inaccurate and somewhat misleading?

The article itself states clearly that the gold plating on jewelry is of the 24-karat variety and the restrictions apply to the base metals whereas the footnote indicates that the restriction is on the gold.—J. S. S.

Answer: The order referred to is L-45, as you probably know, and this order was issued for the purpose of forcing jewelry workers into defense work rather than of conserving base metals.

The use of base metals in the alloying of gold is covered by other orders, such as M-9-c for copper. The order refers to karat gold as defined by United States Commercial Standard CS67-38 in which karat gold covers all gold alloys of ten karat or finer.

In gold plating, gold may be deposited as a 24-karat plate or, if you will refer to Formula No. 3 on page 19 of the Guidebook, you will note that the solution contains not only gold, but nickel also.

Although the question whether 24-karat gold as used for plating purposes should definitely be included under the heading of Karat Gold may be debatable, it was considered advisable to mention this restriction.

Proprietary Nickel Brightener

Question: Can you tell us where we might get in touch with U. S. Research Corp. We are interested in their material called "Nickelux."—R. C. A.

Answer: This corporation has been dissolved but the material, which is a brightener for barrel nickel plating solutions, is now sold under the trade name "Nickelite" by Platers Technical Service Co., 59 E. 4th St., New York, N. Y.

Electrometric Titration

Question: We are in receipt of copies of your articles on electrometric titration of chromic acid and your chart showing the total chromic acid from the pH reading and specific gravity determination. We should appreciate it if you would let us have an actual example of an electrometric titration of a chromic acid solution showing the number of ml. of normal sodium hydroxide used, giving us the actual calculation.

Please give us an example of the pH and Baumé of an actual determination and how you would read it on your chart.—D. L.

Answer: On the subject of electrometric titration of a chromic acid anodizing solution, we refer you to the article by Manuel Sanz published in *Metal Finishing* in October, 1941.

Control of the solution by pH and Baumé is very simple and if you will refer to the chart on page 116 of the February, 1943 edition of *Metal Finishing*, you will note, for example, that the intersection of the lines for a solution having a Baumé of six degrees and a pH of 0.80 gives you the total chromic acid content at the intersection as 50 grams per liter.

Chromic Acid Dip for Passivating Cadmium Surfaces

Question: Regarding the chromic acid dip for passivation of cadmium surfaces, we shall be pleased to have you advise us of the reason for this treatment. Does the passivation of the cadmium surface by chromic acid increase the corrosion resistance of the cadmium plate, and if so, to what corroding media?

We shall be pleased to have you advise us of the composition and other operating data on the use of the chromic acid dip bath for the passivation of cadmium.—G. R. S. Co.

Answer: Army-Navy Aeronautical Specification AN-QQ-P-421a specifies a 3-5 per cent chromic acid dip for 1-2 minutes for cadmium plated parts to be painted. The purpose of the dip is to neutralize traces of alkali from the plated surface and improve the adhesion of the paint film to the deposit.

Hot-Dip vs. Electroplated Zn Coatings

Question: We have been asked by some of the munitions manufacturers to give them full technical information on the difference between electro galvanizing metal parts and electro zinc plating metal parts by the barrel process.

The information they require is the difference in the metallic content of both plating finishes and the rust resisting quality of the two process under salt spray test.

We would appreciate it if you would advise us whether there is a difference between these two platings or whether this is the same process using different trade names. As this will be submitted to the technical department of the Munitions and Supply Department, will you see that the best authority is quoted in your reply.—S. S. Co.

Answer: "Galvanizing" is the term used for zinc coating. "Electrogalvanizing" and "electro zinc plating" are different names for the same process—namely, the electrodeposition of zinc. The term "electrogalvanizing" is used to distinguish this process from "hot galvanizing" in which the zinc is applied by immersion in a bath of molten zinc.

As to corrosion resistance of the zinc finish: Army-Navy Aeronautical Specification AN-P-32 (1942) specifies 0.0005" of zinc and it is expected that this thickness will stand 100 hours in the salt spray.

Outdoor exposure tests seem to indicate that hot-dipped and electroplated zinc coatings have the same protective value provided equal uniformity of deposit is obtained in both cases. This has been determined by C. D. Hocker, A. S. T. M. Symposium on Outdoor Weathering of Metals; also by Blum, Strausser and Brenner, Journal of Research, National Bureau of Standards, *16*, 185 (1936).

Plating Tin on Aluminum

Question: I have a small job calling for a tin plate on aluminum. Who has the best process for this type of work?—W. J. B.

Answer: An immersion tin bath for aluminum was given in the January, 1938 issue of *Metal Industry*, by Brown, Schulberg and Bell. The composition of this solution is as follows:

Sodium stannate	6 oz./gal.
Sodium hydroxide	½ "

The aluminum parts are immersed in this solution for three and a half minutes at 175-180° F. and are removed when the gassing almost ceases. A thickness of approximately 0.0002" is deposited.

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

Orifice-type Collector

A small sized unit is now being added to the line of orifice-type collectors brought out by the Industrial Equipment Corp., Dept. MF, 605 E. Forest Ave., Detroit, Mich. It has a capacity of 1200 C.F.M. and has been designed especially to meet the requirements of the double spindle grinding and buffing lathes, although it is adaptable to many other kinds of work.

It is claimed to be particularly effective in work with magnesium. The cleaning action is caused by the scientifically directed movement of air through an orifice. A compartment at the side collects the sludge and permits its easy removal. Water level is controlled by a special diaphram valve.

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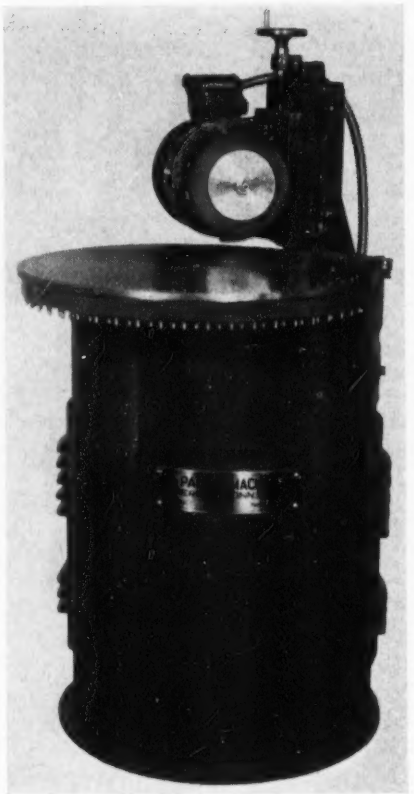


Deburring Machine

The Packer Machine Co., Dept. MF, Meriden, Conn., announces its No. 7 continuous, rotary grinding, deburring, polishing and/or buffing machine.

The No. 7 Packer-Matic is recommended primarily for deburring operations on studs, screws and various special shapes.

Its construction is rugged and compact with built-in flexibility for a wide range of sizes. A second head or wheel can be attached for producing multiple operations.

The table on which are mounted fixtures, or holding devices, runs on a ball-bearing spindle designed and constructed for long life and for ease and accessibility.

Attachments are provided for automatic discharge of work being finished and hopper feeds can be used wherever practical.

The pedestal or base is fully enclosed and includes a dust-tight cabinet as an integral part for all electrical controls.

Wheels may be mounted in either vertical or horizontal positions as required.

Diameter of table, 25½". Height of table from floor, 36". Floor space required, 28" x 47". Main drive motor, ½ h.p. Motor for driving wheels, 1 h.p. or larger as required.

New Emulsion Cleaners

The Enthone Co., Dept. MF, New Haven, Conn., has announced the development of two new emulsion cleaners. One material, called "Enthone Emulsion Cleaner", is an emulsifiable solvent in the ready-to-use condition. It is designed for rapid cleaning of oil, grease and solid dirt without attack on any basis metal including zinc, aluminum, brass, lead, and steel. The use of the cleaner is stated to enable fast, complete cleaning of very oily or dirty work giving more adherent, brighter and less porous electrodeposits and more adherent organic finishes. A saving in alkali cleaner is also claimed. The work to be cleaned is swished about in the cleaner and is then rinsed off in running cold water, which emulsifies the cleaner with all of the dirt. A very short immersion in an alkaline cleaner following this prepares the work for finishing. The cleaner is stated to be of high penetrating power, to have high emulsifiability and to rinse rapidly and completely. Its flash point is above 100° F., and it has no strong disagreeable odor.

The other emulsion cleaner is called "Enthone Emulsion Cleaner Concentrate", and is a base of strong emulsifiers mixed with from 9-15 volumes of solvent naphthas, and used in the same manner as the Emulsion Cleaner. The base enables the obtaining of emulsion cleaners at a somewhat lower cost for users of large amounts of emulsion cleaners.

Photograph of emulsion cleaner on immersion of work in cold water. Note rapid dispersion of cleaner with absence of jelling.

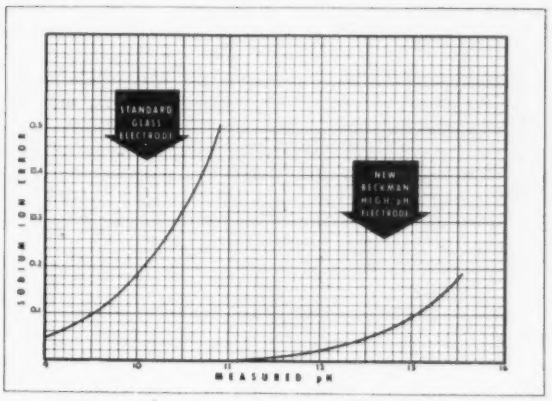
BECKMAN pH NOTES

BETTER PLATING THROUGH MODERN pH CONTROL

NO. 6 OF A SERIES

Showing how pH affects plating of brass, cadmium, zinc, copper and similar metals.

HOW THE BECKMAN "TYPE E" ELECTRODE IMPROVES MODERN PLATING EFFICIENCIES



THE ABOVE CHART shows the accuracy of the Beckman "Type E" Electrode as compared with conventional glass electrode when operating in highly alkaline baths where sodium ions are present. Note how the conventional glass electrode becomes increasingly inaccurate at even relatively low alkaline values, becoming useless at pH values above 11.

In contrast, the Beckman "Type E" Electrode requires no correction whatever at pH 11 and only very small correction at values as high as 13.5 pH!

No other make or type of glass electrode pH equipment has this vital advancement so important to modern high speed plating processes!

THE glass electrode is universally recognized as the most accurate and convenient method of controlling pH in process solutions. But in many alkaline plating baths—particularly cyanide baths for brass, copper, cadmium and zinc plating—operators were unable to use conventional glass electrode equipment to full advantage because of the excessive correction factors necessary.

Then the Beckman research staff made an important development—the Beckman "Type E" Glass Electrode—an electrode that can be used in highly alkaline solutions, *even in the presence of sodium ions,* with little or no correction necessary.

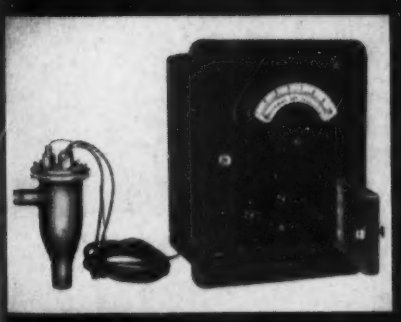
This electrode has been described by recognized plating authorities as "the first practical and accurate method for pH control of cyanide plating baths." With it more uniform deposits can be obtained—at higher plating speeds—with fewer rejects!

Whether your plating operations are on a small or large scale, investigate the vital savings in time and material that you can make with Beckman pH Control. There's a Beckman pH instrument to fit *your* requirements. Write for detailed information!

SEND FOR THIS FREE BOOKLET

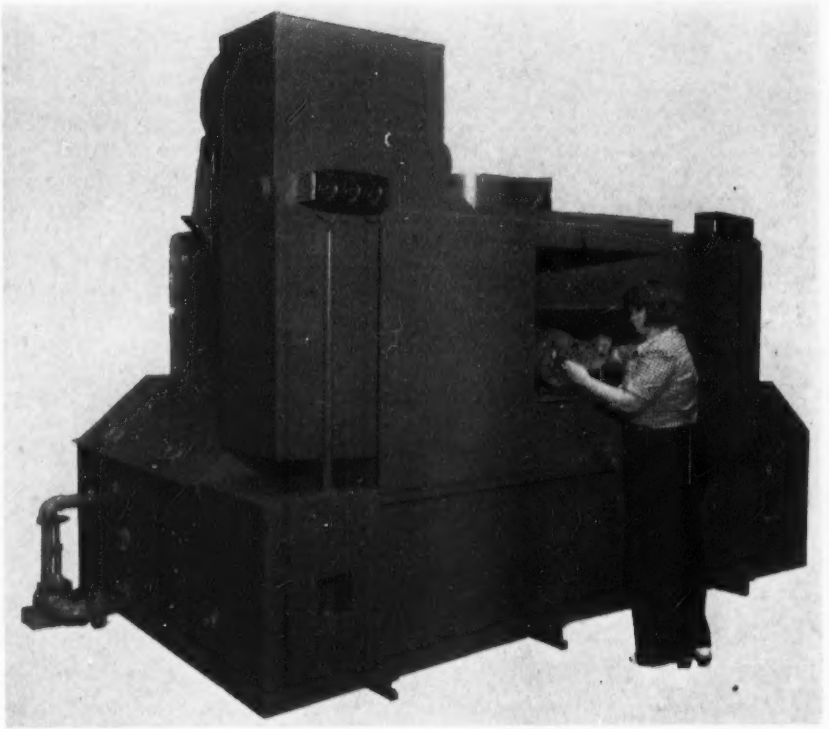
"What Every Executive Should Know About pH" . . . an interesting, informative booklet on the fundamentals of modern pH control. Ask also for Bulletin 86 which lists and describes Beckman instruments, electrodes and accessories!

BECKMAN PRECISION INSTRUMENTS
NATIONAL TECHNICAL LABORATORIES
South Pasadena California



THE BECKMAN AUTOMATIC pH INDICATOR is the most advanced pH instrument available for large-scale plating operations. Automatically indicates, records, and controls. *Ask for Bulletin 16!*

THE BECKMAN INDUSTRIAL pH METER is ideal for portable plant and field use in the electro-plating plant. Highly accurate, simple to operate, ruggedly built. *Ask for Bulletin 21!*



Segmented Cabinet Washing Machine

The machine pictured here, manufactured by the Industrial Washing Machine Corp., Dept. MF, New Brunswick, N. J., is known as the Segmented Cabinet washing machine.

The machine consists of a large mesh turntable (or special fixtures depending upon the nature of the work to be cleaned) which rotates slowly. Surrounding the turntable is the housing which is portioned off into various combinations of washing, rinsing (or slushing) and drying.

The parts to be cleaned are placed either directly upon the mesh, or on the fixtures. As the turntable rotates, it carries the work through the above-mentioned cleaning operations and returns it to the same operator who does the loading.

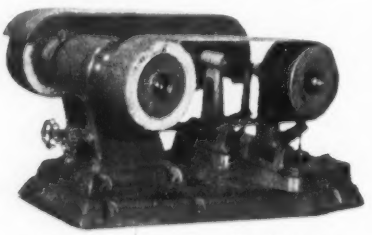
Production ranges from 1½ to 7½ square feet of work per minute.

Advantages of this new type machine are:

1. Only one, inexperienced operator needed.
2. Small floor space occupied (10½′ x 6½′).
3. Superior spray coverage.
4. Any of the cleaning detergents now on the market can be used.

Machines of this type are now in use cleaning cylinders, gears, piston rings, connecting rods, master rods, pistons, machined castings, die castings, rocker arms and flexible metal conduit.

Newer designs have a more compact exhaust hood.



Bench Grinder-Polisher

The bench grinder and polishing machine illustrated above has been added to the line of abrasive belt grinding equipment manufactured by Jones Engineering Co., Dept. MF, Ellwood City, Pa.

This is a handy, fast-cutting unit designed for production work. Ruggedly constructed, it fits on any standard shop bench. Using endless abrasive belts it replaces small grinding wheels and troublesome hand-coated abrasive polishing wheels. It is claimed the unit is adaptable to any type of grinding and finishing from flat pieces to irregular-shaped parts.

The unit is mounted on a sturdy, one-piece base and features precision ball bearing construction throughout. Controls are located at the front handy to the operator, for belt alignment. An adjustable spring tension device on the idler pulley maintains belt tension. The grinder may be used with any ¾ to 2 h.p. motor. Since the motor is mounted underneath the bench, away from dust and dirt, an enclosed type motor is not necessary.

Model No. 135, as the equipment is known, has a patented, cushioned, segment face contact wheel; uses sharp, fast-cutting, factory-coated abrasive belts, and has the company's Rubber Contact Roll.

Specifications and complete details on the unit are available in Bulletin No. 135.

New Low Loss Resistor Coil Coating Developed

The Pemco Corp., Dept. MF, Baltimore, Md., has just announced production of a new type low-loss resistor coating that will be marketed under the trade name of "Lectraseel".

The material is a vitreous coating that has been undergoing field and laboratory tests for the past five years but it is only recently that the company felt it was sufficiently efficient to stand up under wartime operations and requirements.

This new coating is claimed to be highly resistant to thermal shock and in the opinion of the company's engineers, its co-efficient o expansion and contraction will usually parallel that of ceramic cores now in use and meeting government requirements. Accelerated weathering tests are said to indicate that a coil coated with this substance is immune to corrosion and should give satisfactory low loss service over a long period, even under adverse conditions.

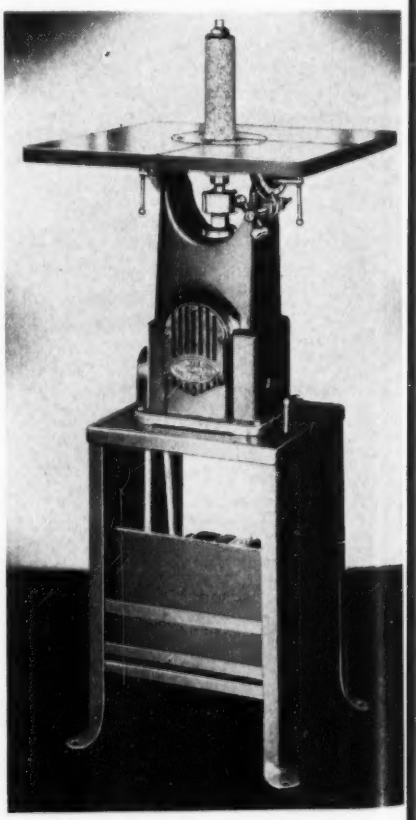
Spindle Sander

The new oscillating spindle sander, offered by Boice-Crane Co., Dept. MF, 970 Central Ave., Toledo, O., is said to use the smallest diameter abrasive sleeve of any low-priced spindle sander. It provides a full range of sizes, ¾″, 1½″, 2″ and 3″.

Portable and vibrationless, this equipment sands any degree of bevel up to six inches in height. It can be used for grinding aluminum, masonite, brass die castings, and sheet iron and for sanding faces which blend gradually through different slopes at successive cross-sections.

The 20″ x 20″ table tilts both ways 45 degrees. It is geared for close setting. Two scribed index lines show exact positions for beveling, drafting patterns, and for core-box work.

The ¾″ and 2′ nesting rings are regular equipment. The crank case is claimed to be dust and leak-proof. The bearings are grease-packed and factory sealed.

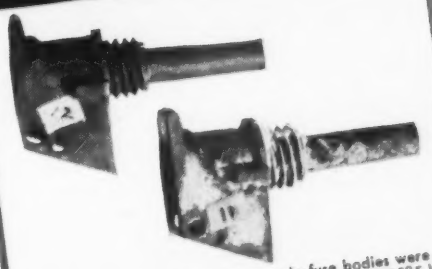


Oscillating spindle sander.

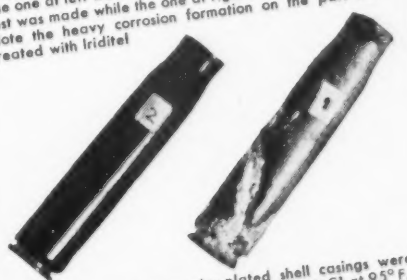
IRIDITE

Gives your Product Low-Cost CORROSION PROTECTION in 10 to 60 Seconds!

VISUAL PROOF OF THE ABILITY OF IRIDITE TO RESIST CORROSION
(all photos unretouched)



Both of these die-cast hand grenade fuse bodies were subjected to 200 hours' salt spray (20% NaCl at 95° F.) The one at left was coated with Iridite before the spray test was made while the one at right was left uncoated. Note the heavy corrosion formation on the part not treated with Iridite!



Both of these 20-mm. zinc-plated shell casings were subjected to 200 hours' salt spray (20% NaCl at 95° F.) The one at left was coated with Iridite before the spray test was made, while the one at right was left uncoated. Note the heavy corrosion formation on the part not treated with Iridite!

• Here's your answer to speedy, low-cost, corrosion protection for zinc and cadmium plated parts. For, following a 10 to 60 second dip in Iridite Solution, parts can be immediately rinsed in hot water, dried and ready for shipment. No special equipment is necessary.

This new chemical coating is "soaked up" by the plated metal . . . becomes integral with it . . . is so thin that it does not "pile up" to alter the dimensions of the part. Uniform, opaque and olive drab in color, Iridite matches the familiar shade used by the armed forces for camouflage. In addition, the great flexibility of Iridite permits parts to be drawn or formed without chipping, flaking or affecting the protective qualities of the Iridite coating.

The Iridite process greatly increases the field of usefulness of zinc and cadmium as protective coatings, and can be applied to plated parts of any type or size, except in containers for edible products.

Send today for full details on Iridite. Better still, send us a plated part for Iridite coating; then test it in any way you like.

Rheem Research Products
INCORPORATED
Subsidiary of Rheem Manufacturing Co.,
2523 Pennsylvania Ave., Baltimore 17, Md.

AFTER SELECTIVE PLATING

Clean, Sharp LINES OF DEMARCATION

On Parts Which Were Masked With MICCRO - SUPREME STOP-OFF LACQUERS

Gear above was masked to permit silver plating of bearing surfaces only.

Part to right was masked for copper plating prior to carburizing. Gear teeth only were stopped off.

Miccro-Supreme Stop-Off Lacquers HR-302 (Red) and HB-401 (Black) are used for the masking of parts prior to selective plating. They provide exceptional adhesive qualities which assure a clear line of demarcation. They can, however, be quickly and easily removed, permitting thorough cleaning of all parts which have been coated. Because of their rapid air-drying qualities, time between coating and preparation for plating is reduced to a minimum.

These materials are perfectly neutral, containing no acids or other harmful ingredients, hence will not etch or stain the surface of precision lapped or super-finished parts. WRITE FOR FULL DETAILS.

MICHIGAN CHROME & CHEMICAL CO.
6348 EAST JEFFERSON • DETROIT 7, MICHIGAN

Fume Exhauster

Chelsea Fan & Blower Co., Inc., Dept. MF, 1206 Grove St., Irvington, N. J., have developed the fume exhauster illustrated above.

The important feature of this unit is that fumes, gases, dust, filings and grinding compounds do not come in contact with the motor.

The newly developed centrifugal type blower wheel is made of ⅛" thickness of steel. The 3 h.p. ball bearing motor is tested to an overload capacity. The framework is welded into a heavy unit with handles for carrying. The adapters are interchangeable and can be used for suction or blowing.

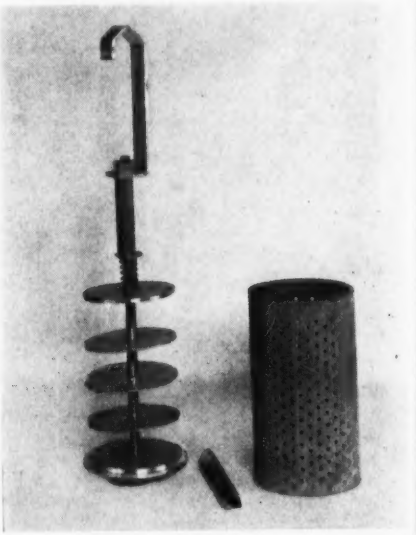
Air-Operated Controller

A new, air-operated, automatic control instrument, known as Convertible Free-Vane Controller, has been announced by the Bristol Co., Dept MF, Waterbury, Conn. The new instrument is made for automatically controlling temperature (up to 3600° F.) flow, liquid level, pressure, draft humidity, pH value, and time program.

The unit operates on the same basic principle as that used in previous models offered by the company; however, several design refinements have been incorporated, which simplify the instrument and make it more convenient to service. The new instrument is also designed so that the user can convert from one type of control system to another.

The following types are available: Monoset (on and off), Ampliset (throttling), Preset, Reset, and Magniset.

The adjustments for fitting the controller to the requirements of the process are located on a dial board above the chart.



Fixture for Small Parts Anodizing

This fixture, designed for small parts that are suitable for bulk anodizing, is a product of George L. Nankervis Co., Dept. MF, 5408 Commonwealth Ave., Detroit, Mich. The cylinder is made of micarta and is 12" long, 6" inside diameter and has a wall thickness of 5/16". The balance of the fixture is of 24 ST aluminum. The bottom plate is ½" thick, the top plate ¼" thick and the three intermediate plates are ⅛" thick. The cylinder is drilled to the customer's specifications. Standard diameter holes are ⅛" or ¼". The bottom plate is welded to ¾" central rod and this rod is threaded 4" down from the top. An aluminum sleeve 1" outside diameter and 8" long is furnished with each fixture. This is to be used when a partly filled basket of parts is being run. The two spacers shown in the photograph below the intermediate plates are for photographic purposes only to show the fixtures more advantageously. In anodizing parts the micarta cylinder is placed in position over the bottom plate and parts to be anodized are placed in the inside to a depth of about 3"; then one of the intermediate plates is placed over the rod, down on the parts. More parts are then placed in the basket to a depth of three more inches and the second intermediate plate is used. After the basket has been filled the top plate is placed over the rod and down on the parts, the washer, handle and nut are then placed on in that order, and pressure is applied to the nut after the parts have been thoroughly shaken down. This fixture cannot be insulated to advantage because of the necessity of electrical contact throughout the contents.

Face Shield

The M. S. A. Type "H" Faceshield illustrated above has been developed by the Mine Safety Appliances Co. for quick attachment to the company's protective hat.

The new face shield, providing durable and convenient protection for the face against flying particles, is readily assembled to "K" Skullgards in the field, making possible easy adaptation to those now in service.

Positive attachment is assured, it is said, and the face shield can be removed as quickly as it can be attached, thus permitting use of the Skullgard alone at any time.

Clear, transparent plastic visors, 14" wide x 6" long, are employed. The visors are fastened to the combination unit in a novel but practical manner, affording easy means of replacement. Visors are interchangeable. The fiber visor retaining strap is mounted on a pivotal joint, allowing upward or downward movement to the position desired by the operator.

Further details on this unit are available in a new bulletin, No. CE-22, copies of which may be secured by writing to Mine Safety Appliances Co., Dept. MF, Braddock, Thomas and Meade St., Pittsburgh, Pa.

New Principle for Aluminum Deoxidizing and Cleaning Prolongs Life of Anodizing Racks

Aluminum deoxidizing, as applied to stripping and cleaning aluminum, is usually done with the use of alkali or acid solutions. The severe action of these alkalies and acids etches the aluminum and removes a substantial amount of its surface, which is objectionable.

A new principle, embodying the use of an alkaline solution known as "Deox-Aluminum" (which is used as a dip, at room or elevated temperatures, from about 10 seconds to 1 minute), is announnced by Technical Processes Division, Colonial Alloys Co., Dept. MF, Philadelphia, Pa.

The procedure is to dip the aluminum into the solution until a uniform grey coat is deposited over the metal surfaces. The appearance of the film is a timing indicator to remove work from the bath. The grey coated aluminum is then rinsed and dipped into a solution of 30-50% nitric acid, at room temperature. This removes the grey coat and leaves the metal chemically clean. It is claimed the attack on the aluminum surfaces is negligible, and that very little metal is removed from these surfaces. The grey coat may be left on the surfaces, if desired, for it is said to be galvanically protective to aluminum, to act as a paint base, to prevent oxidation in transit or in storage or hold-over operations, and under certain conditions, to act as a solder base. The material is recommended for use on all alloys of aluminum in the wrought cast, or forged forms.

"Deox-Aluminum" is supplied as salts and is mixed with water by the user in the amount of about 12 oz./gal. The solution may be kept in a container of steel, wood, or glass or rubber lined tanks, or any alkaline resisting material.

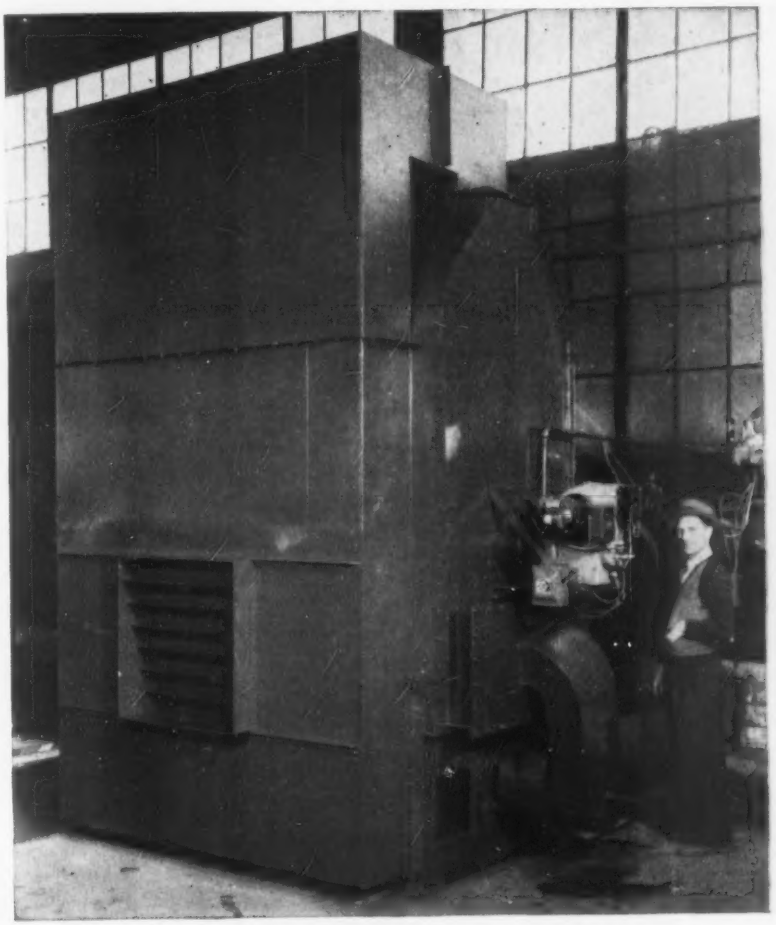
If used at room temperature, venting is not necessary. If used above 120°F, venting is recommended.

Direct Fired Air Heaters for Dehydration and Chemical Processes

Output temperatures between 150 and 350° F, with the heated air free from contamination can now be obtained from coal or oil burning direct fired heaters without the use of critical alloy steels, it is said, by a method developed by Dravo Corp., Dept. MF, 300 Penn Ave., Pittsburgh, Pa.

These high temperatures are obtained from heaters with carbon steel combustion chambers by means of a recirculating device. The recirculating principle allows heated air to be fed back to the heater's intake, so that the normal temperature rise obtainable by wiping air around a carbon steel fire box will produce any temperature up to 350° F, according to the percentage of the air that is recirculated. This percentage is regulated by a damper in the recirculating duct. To produce 350° F, 80% recirculation is required.

Saving of fuel as a result of high efficiency of heat abstraction and negligible radiation losses; quickness of installation; availability for quick shipment; flexibility of the installation as regards later plant extension, and the fact that skilled labor is not required for its operation, are important factors claimed for this method. Such heaters are available for oil, gas, or coal as fuel, and heaters designed for coal can be converted to oil or gas when conditions make these fuels available.



New type air heater.

Investigate our

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TRADE MARK

PALLADIUM PLATING SOLUTION

The electrodeposition of Palladium on base metals has found many uses in a number of industries. Copper, brass, silver etc. can be plated with coatings of .00001" thicknesses at reasonable cost.

Palladium being a member of the platinum group family gives excellent corrosion and tarnish protection.

For further information on this brilliant white non-tarnishing plate write to:

PRECIMET LABORATORIES

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Research & Development Engineers in Precious Metals

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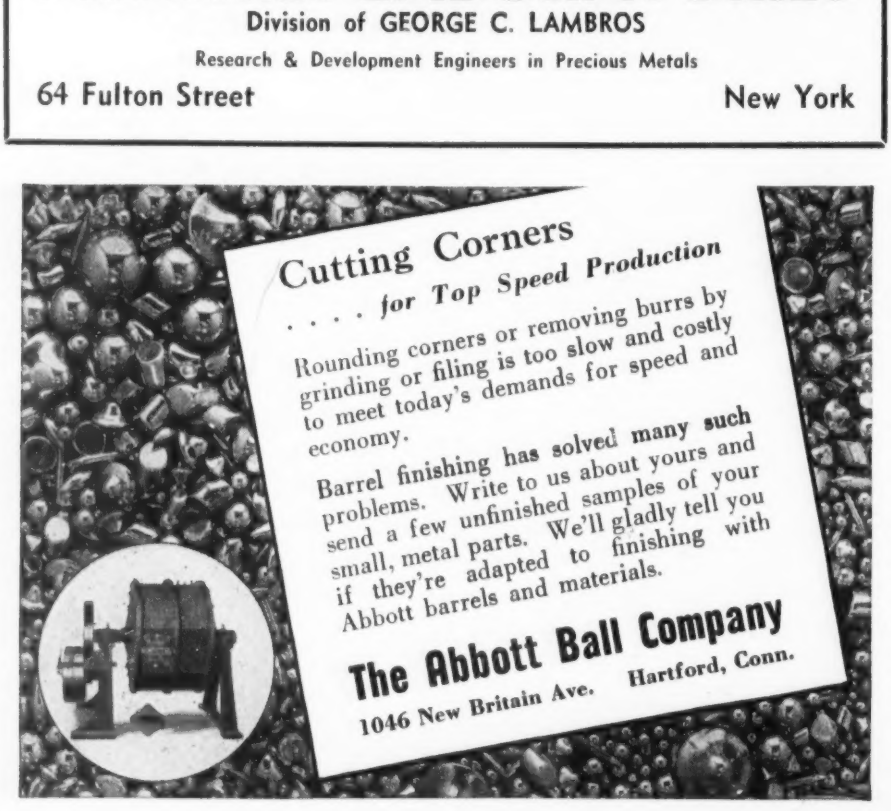

Cutting Corners
. . . . for Top Speed Production
Rounding corners or removing burrs by grinding or filing is too slow and costly to meet today's demands for speed and economy.
Barrel finishing has solved many such problems. Write to us about yours and send a few unfinished samples of your small, metal parts. We'll gladly tell you if they're adapted to finishing with Abbott barrels and materials.
The Abbott Ball Company
1046 New Britain Ave. Hartford, Conn.

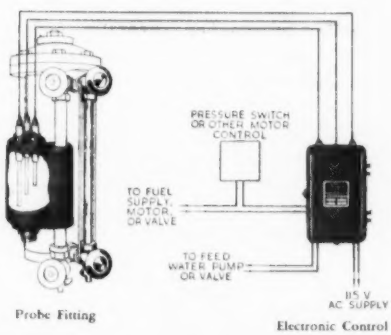
New Electronic Control Regulates Boiler Feedwater Automatically

Combustion Control Corp., Dept. MF, 77 Broadway, Cambridge 42, Mass., has announced Fireye Electronic Feedwater Controls Series P156N, for maintaining constant boilerwater levels automatically, and for guarding against low-water hazards. Designed to provide the average power plant with low-cost automatic control, it is claimed the equipment eliminates difficulties encountered with complicated mechanical devices. It is guaranteed for an unlimited service-free life.

For automatic feedwater pump control and low-water protection, Fireye Type P156N is used with Probe Fitting Type H53, as shown in the accompanying illustration. The probe fitting may be mounted parallel to the water column, or directly on the boiler, and is wired to the electronic control. Three probes within Type H53 mark boiler feedwater pump on and off levels and a low-water danger point. The top and middle probes determine the high and low levels at which the boiler feedwater pump is turned on and off to maintain constant water level. When water falls below the middle probe, the equipment closes the electrical circuit controlling the pump and water feeds into the boiler. When the level rises to the top probe, the water itself acts as conductor of a minute electrical current which operates the electronic control and turns off the pump. The pump remains inoperative until boiler water again falls to the level of the middle probe. The lowest probe defines the danger point below which boiler water must not fall. Should water drop below this safety probe the fuel supply is immediately shut off and an alarm is sounded.

Types are available also for automatic pump control only, or for low-level protection only.

Fireye Boiler Feedwater Controls are supplied as standard for boiler pressures to 300 pounds and for operation from a supply of 115 or 230 volts a.c., 60 cycles. The equipment governs solenoid valves, small horsepower pump motors, or pump motor magnetic starters. The probe housing is furnished in either cast or malleable iron, and the electronic control in a weatherproof pressed steel housing, both attractively finished in green crystal.


PRESSURE SWITCH OR OTHER MOTOR CONTROL
TO FUEL SUPPLY, MOTOR OR VALVE
TO FEED WATER PUMP OR VALVE
115 V. AC SUPPLY
Probe Fitting
Electronic Control

Typical installation for automatic boiler feedwater control and low-level safeguard.

Manufacturers' Literature

Polishing and Buffing Wheel Speed Table

Divine Brothers Co., Dept. MF, Utica, N. Y., has just published a new wheel speed table. It has been condensed to permit easy pocket insertion for quick reference on the job.

To simplify its use, the preferred or recommended speeds are shown in red. Where two red figures appear in a vertical column, the lower speed is for polishing, the higher for buffing.

Indium

The Indium Corporation of America, Dept. MF, 60 East 42nd St., New York, N. Y., has just issued an eight-page, illustrated leaflet, discussing the progress in the development and use of indium and its chemical and physical properties. Adequately illustrated with photographs and diagrams, it tells the story in a lively manner.

Cleaner

Sun Oil Co., Dept. MF, Philadelphia, Pa., has issued a folded leaflet entitled "Case Histories of Cleaning Up War Parts." The leaflet discusses the cleaning job done by the company's Sun Spirits.

New Bulletin on Recording Thermometers

A new bulletin, No. T800, with 40 pages of useful and technical information on thermometry and thermometers, has just been published by *The Bristol Co.*, Dept. MF, Waterbury, Conn. The bulletin describes its line of recording thermometers with considerable space given to the basic theory of the several types offered, as well as practical information regarding ranges, charts, bulbs, and tubing available.

Emulsion Cleaning

The Enthone Co., Dept. MF, New Haven, Conn., has just issued a four-page bulletin describing the company's emulsion cleaners. These cleaners are designed for rapid cleaning of all types of basis metals without attack and are recommended for cleaning of badly contaminated work.

Basic Information on Coated Abrasives

Behr-Manning, Dept. MF, Troy, New York, has published a service booklet which is a handbook for distributor salesmen, and gives fundamental information on the manufacture, storage and uses of coated abrasives, with many illustrations. It gives such elementary facts as, what constitutes a quire and a ream of sandpaper; how many yards in a standard roll; how the different grit sizes are produced and how they compare with one another, and explains the unit system of eliminating the too small order problem.

Buy War Bonds to INSULATE America's Future!

INSULATION SPECIALISTS

● We make chemically resistant insulation engineered to meet almost every condition in the manufacture of WAR materials:

ZINC and CADMIUM Plating Racks

Racks and Fixtures for Production Hard CHROME

PARKERIZING and BONDERIZING Fixtures

ALUMINUM ANODIZING Racks

Insulation for Fume Ducts and Bus Bars

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Stop-Off for Use In All Plating Solutions

● Insulation will increase production and lower costs. If you will outline your problem our Engineers will gladly submit samples of the right grade of BUNATOL for your needs.

NELSON J. QUINN CO., TOLEDO 7, OHIO

● **Buy War Bonds to STOP-OFF the Axis!** ●

Plating Equipment Catalog

Frederic B. Stevens, Inc., Dept. MF, Third and Larned St., Detroit 26, Mich., has just released a new, 40-page, plating equipment catalog.

Fully illustrated with photographs of the machinery described, this catalog covers the company's line of full automatic and semi-automatic plating machines, cleaning and pickling units, as well as bright dipping and special processing equipment.

Several improvements and new developments have been made since the issuance of the previous catalog and those on which there are no government imposed photographic restrictions, are shown.

Abrasive Specialties

"3-M Abrasive Specialty Items" is the title of a new manual issued by the *Minnesota Mining & Manufacturing Co.*, of Dept. MF, St. Paul, Minn. It shows the latest types of abrasive shapes and forms that have been devised for grinding and finishing metal.

With photographs, this book shows the various products in actual use in finishing a variety of items from huge ship propellers to the smallest machine part. The company's specialty items include Belts, Evenrun Bands, Cones, Sleeves, Cartridge Rolls, Overlap Slotted Discs, Slotted Discs and Pyramid Discs. Hard-to-get-at areas of all sizes and shapes are said to be quickly ground and finished by these items.

PURICO PUR-BLAC

Black Finish for Steel & Iron
One bath, low temperature salts

Let our Technical Department Process Samples for you.

•

PURICO ZN BLACK

A hard adherent black for zinc and zinc die castings

PURICO A. P. I.

(Acid Pickling Inhibitor)

PURICO PUR-BUR

A new compound for the deburring of aluminum

•

THE PURITAN MFG. CO.

WATERBURY, CONNECTICUT

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SOLUTIONS & DEPOSITS

Controlled with simple direct reading test sets.

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New Books

The Physics of Metals. By Frederick Seitz. Published by McGraw-Hill Book Co., Inc., New York, N. Y. 1943. 330 pp. Price $4.00.

The author has made a definite effort to present the subject of the structure and behavior of metals in a clear, non-mathematical manner. Like most physicists, however, he cannot allow good analogies and clarity of expression to stand by themselves. Mathematical derivations and terms requiring (but not given) further definition also are profusely and often exclusively used.

Thus the book is an odd mixture having readable parts of value to the average shop man and other sections that would be of paramount value as class room text. As a matter of fact, it is based on a series of lectures given to metallurgists and physicists at the University of Pennsylvania.

Many valuable references are given.

Manual of Industrial Hygiene and Medical Service in War Industries. Edited by William M. Gafafer. Published by W. B. Saunders Co., Phila., Pa. 1943. 508 pp. Price $3.00.

This book gives an over-all picture of the information which an industrial hygienist must know. There are chapters on the organization of factory medical departments, and the handling of mental and physical diseases as they affect production. Considerable specific attention is given to problems presented by new materials, methods and situations introduced by the war.

The subject of electroplating is given one and a half pages with some specific data on ventilation and allowable concentration in the air of toxic substances.

1943 Volume on A.S.T.M. Chemical Analysis of Metals

When the A.S.T.M. Book of Standards was issued for the first time in three parts a few years ago the several methods of chemical analysis of ferrous and non-ferrous metals were published in a separate volume. Now again after intensive work the society's Committee E-3 (Chemical Analysis of Metals) and E-2 (Spectrographic Analysis) have completed activities leading to the publication of this 1943 book.

The 332-page volume gives two sampling methods, 17 standard and tentative methods of which four are for the analysis of ferrous metals, ten for non-ferrous, and three cover quantitative spectrochemical procedures for non-ferrous metals. An important new feature is the Tentative Recommended Practice for Apparatus and Reagents for Chemical Analysis of Metals (E 50). Other helpful material published as information gives method for the chemical analysis of special brasses and bronzes, and of white metal bearing alloys; also a procedure for aluminum in solder metal, and methods of sampling wrought metals and alloys for determination of chemical composition.

These analytical procedures are very widely used in judging the content of the various materials. The committees con-

stantly are endeavoring to keep the methods in line with current practice and particularly to take advantage of competent new shorter procedures.

The extensive methods of chemical analysis of steel, iron, etc. (E 30), covering some 83 pages, are an important part of the publication. There are three standards pertaining to ferro-alloys including sampling and analytical methods. A comprehensive standard covers aluminum and aluminum alloys (20 pages) and another the magnesium field. Two relate to copper and brass. Other methods cover slab zinc, zinc-base die casting alloys, nickel, electrical heating materials, pig lead, and various lead and tin-base alloys—solder metal, bearing alloys, etc.; also covered are silver solders and three spectrochemical analysis methods relating to high grade pig lead, zinc, and zinc alloy die castings.

An extensive 20-page index enables one quickly to find applicable procedures.

Copies are available from the Headquarters of the Society, 260 S. Broad St., Philadelphia 2, Pa., in blue cloth binding styled to match the Book of Standards at $3.00 per copy.

Associations and Societies

Galvanizers Committee

The Galvanizers Committee, which is sponsored by the American Zinc Institute, will hold a wartime conference at the William Penn Hotel in Pittsburgh on Wednesday and Thursday, November 17th and 18th.

In making this announcement, it was stated that, the usual Spring meeting having been omitted, many important subjects must now be discussed, which makes this Fall meeting essential.

The special program committee, headed by *D. A. Russell* of *Youngstown Sheet & Tube Co.*, has arranged for the discussion of a variety of subjects during the two-day, four-session meeting. The committee has specially invited some equipment and supply friends to share the platform and join with the audience on Wednesday, November 17th, the first day of the meeting. In accordance with usual practice, the sessions on Thursday will be open only to members of the committee and their representatives. New operating processes and techniques will be discussed, as well as current and future problems both in the producing and marketing divisions of the industry.

The meeting will end on Thursday afternoon with a business session, when successors will be named to fill the places of the two retiring members of the Governing Board, which now consists of the following: *N. E. Cook*, chairman, *Wheeling Steel Corp.*; *B. P. Finkbone, American Rolling Mill Co.*; *D. A. Russell, Youngstown Sheet & Tube Co.*; *J. L. Schueler, Continental Steel Corp.*; *W. R. Shimer, Bethlehem Steel Co.*; *Robert Stoker, Carnegie-Illinois Steel Corp.*, *F. G. White, Granite City Steel Co.*

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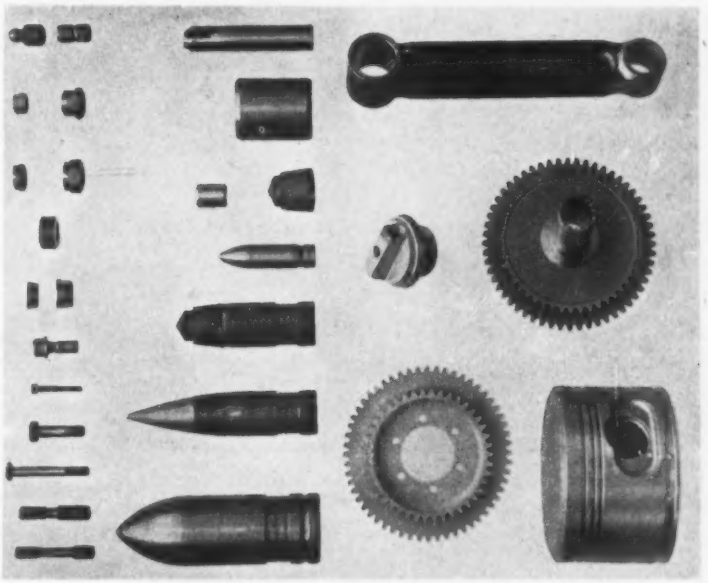

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(*Concluded from page* 705)

Aviation engine starters	After heat treatment.
Machine gun parts	(a) After heat treatment; (b) Prior to soldering of water jacket.
Armor piercing shells	After heat treatment prior to soldering caps to bodies—tin film deposited makes soldering easier and joints stronger. Also used prior to painting.
Tank transmission parts	After heat treatment.
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Hydraulic control devices	After heat treatment.
Rubber molds	To clean between service runs of rubber military supplies.
Bullet dies	To remove scale after heat treatment for hobbing.
Fuses	After heat treatment prior to plating.
Bomb casings	After soldering prior to painting.
Bourdon tubes	After heat treatment.
Steel-backed bearings	Before babbitting.
Torpedoes	(a) After heat treatment; (b) Prior to soldering.
Diesel engine parts	After heat treatment.
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Steel cartridge cases	Prior to plating.

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The metal may be sprayed directly on the untreated wood surface of the pattern or core box. If the wood surfaces are hard or close-grained, a shellac primer is first applied, the metal being sprayed on before the shellac dries. The thickness of the metal coating is about 5 thousandths of an inch.

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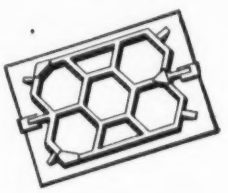

This wooden pattern coated with sprayed metal has given service far beyond its normal life.

Fine detail easily recorded in the alloy sprayed onto pattern.

X-56

National Safety Council

Reorganization of the activities of the National Safety Council's industrial safety engineering division recently has been accomplished to provide more practical and specific assistance with accident and health problems in modern industry.

The new plan, which is in line with the general reorganization of the Council's program, makes full use of the industrial membership sections as centers for the accumulation and distribution of all safety information in their respective fields.

Each safety engineer on the staff has been appointed as staff contact man for one or more of the industrial sections. He has been assigned in accordance with his experience and knowledge of the industries represented in the sections. As contact man, the engineer is expected to work with the various sub-committees of the sectional executive committees on all sectional problems.

Industrial Hygiene Foundation

The Eighth Annual Meeting of Industrial Hygiene Foundation will be held at Mellon Institute, Pittsburgh, on Wednesday and Thursday, November 10 and 11.

The foundation's Board of Trustees, meeting in New York in August, voted unanimously for the annual meeting as a help in maintaining healthful conditions in war plants, which in turn helps maintain manpower.

With labor shortages slowing production in some industries, and with manpower demands rising, no workdays must be lost through failure to control toxic exposures in the work place. Manpower must be maintained and that demands the maintenance of a healthful plant.

More men and women must work harder to offset the manpower shortage—work like the men in the armed forces. That demands top physical condition.

Practical, workable measures for the health maintenance of men and plants will comprise the program for the annual meeting.

American Electroplaters' Society

CHICAGO BRANCH

The 32nd annual educational session and banquet of Chicago Branch, A. E. S., will be held at the Palmer House on Saturday, January 22, 1944. For reservations, write Secretary J. W. Hanlon, 3004 N. Whipple Street, Chicago, Ill. Tickets, $5 each.

DETROIT BRANCH

The annual educational session and banquet will be held at the Hotel Statler, Detroit, on Saturday, December 4, 1943.

Carl Heussner of the *Chrysler Corporation* will preside over the educational session which will start at 2 P. M. The following talks are scheduled: "Porous Chrome," by *Hendrik van der Horst*, and "Looking to the Future," by *A. C. Horrocks. Dr. Munger, Republic Steel Corp.*, will also appear on the program.

The banquet will start at 7 P. M. and will feature entertainment and dance music. Tariff, including tax, $5.

LOS ANGELES BRANCH

A talk by *Carlyle Artran*, air conditioning engineer of the *General Air Conditioning Co.* of Los Angeles, on "Ventilating of the Plating Shop," featured the October 11 meeting of Los Angeles Branch, A. E. S., at Hotel Rosslyn.

Declaring that most electroplating shops are insufficiently or inadequately ventilated, Mr. Artran presented a general discussion of shop ventilation, outlining the proper types of roof and wall fans for large shops, hood types for various tanks, and also went into considerable detail concerning the manner in which hood mouths should be shaped for proper removal of fumes from acid tanks.

The type of ventilating system most commonly used in electroplating shops, Artran said, is the exhaust type, so named because the air is sucked, rather than pushed, out. He explained that an open end of pipe is the simplest hood and also one of the least efficient. The deficiency in this type of hood, Artran declared, lies in the fact that it does not make provision for the laws governing air in motion. The commonest method, he explained, for improving the performance of the open pipe hood is to add a taper or to flange the pipe end.

Electroplating tank hoods of the rim inlet type are relatively inefficient, the speaker said, but this shape is dictated by the operations of loading, unloading and moving the work from tank to tank. The probable efficiency of the average tank hood drawing

air through narrow slots along the two sides will be about 40%, he said, which ratio can be raised to about 50% by careful design.

The speaker explained that when compressed air is blown through a nozzle, as is common practice in plating rooms, the air carries some distance at considerable velocity. If the direction of air travel is reversed so that the air is drawn into the hose, the effect of the draft is apparent only a short distance from the end of the hose. This, he said, explains the difficulty of reaching out with an exhaust hood to influence fumes or dust any great distance from the hood's face.

Artran stated that for fume or dust ventilating systems the use of round rather than rectangular pipe will be found more practical and that at fittings, where the air must change direction or velocity, the change should be effected as gradually as cost and space limitations will allow.

On ventilating fans for plating rooms he said that, generally speaking, the propeller fan will move more air per dollar cost of equipment and operation, than the centrifugal type fan. While the multiblade centrifugal fan finds wide application in the heating, ventilating and air conditioning fields, Artran explained it is not the best choice for handling corrosive fumes or abrasive dust because of its large number of light gauge blades and the manner in which they are fastened. The backward curved or backward inclined fan, he said, has fewer blades of heavier gauge metal and can be applied successfully to fume exhaust problems, such as are prevalent in plating shops.

For grinding, buffing and polishing wheel operations, the paddle wheel fan is universally used because it has the ability to handle all sorts of air-borne material directly through the fans, the speaker stated.

The cyclone, Artran declared, is the cheapest and most effective means of collecting common dusts encountered in industry. He explained that while in the larger sizes, the cyclone will not separate very fine particles, such as talc, it can be used effectively on grinding, buffing and polishing dust.

The habit of plating shop operators to regard shop ventilation as something to be installed as cheaply as possible was deplored by the speaker, who pointed out that since the generator is the most expensive single item in the plating department, it would seem logical to take out insurance for it in the form of a dust and temperature protective ventilating system.

He cited efficient air filters as one of the most successful systems for generator rooms. The entire system would consist of filters, an inexpensive multiblade fan and drive,

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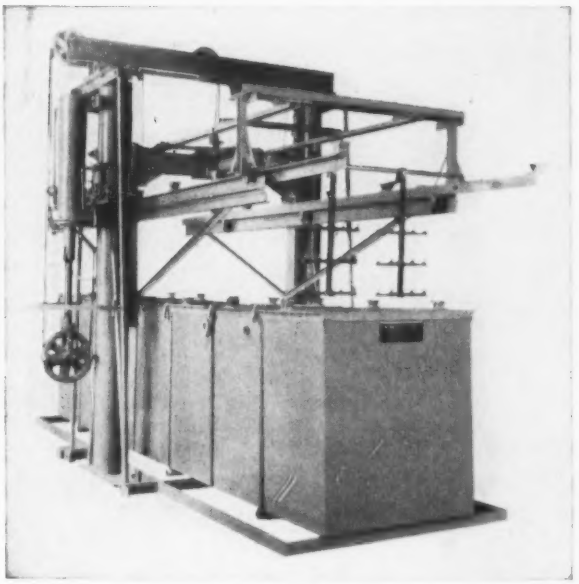

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Magnus 731—the new emulsion cleaner was developed to meet the need for a safe, speedy metal cleaner for the many cases where chips, loosely bonded dirt and lubricant must be removed without the need for providing a chemically clean surface.

It does a quick, thorough job, leaving the work with a slight coating of oil for anti-rusting protection while work is being held for subsequent operations, or shipped to other plants.

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Magnus 731 is used straight as a pre-clean dip or a spray before solvent degreasing, or in a 1-100 water emulsion. It works equally well as a spray or dip, and requires no rinsing. Where a heavier, anti-rusting oil film is required, emulsion may be made up to 4-100 proportions.

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piping to carry the air to the windings, commutator, and properly sized relief air openings for the room or enclosure. The room, he emphasized, should be kept under a slight pressure at all times to prevent the infiltration of dust and fumes, and the fresh air location should be chosen carefully in order to secure the coolest, cleanest air.

He recommended the addition of evaporative cooling for large installations. For protection of the exhaust fan operating on chrome plating tanks, Artran recommended the insertion of a separator in the pipe before it connects to the fan inlet.

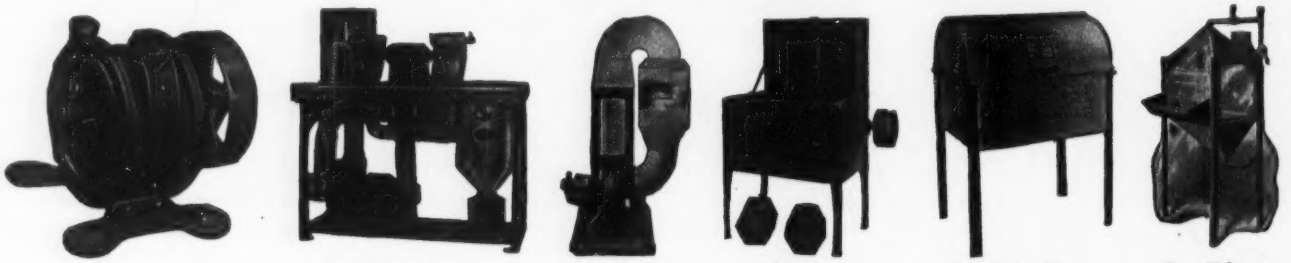
For high-production plating plants the addition of an after-condenser may be indicated, he pointed out. Such a condenser, he added, uses water to clean the exhaust air of chromic acid and other particles and fumes and employs either sprays, straight impingement, or wetted pads of glass or fiber.

The second speaker of the evening was *John Beall*, chemical engineer of the *Harshaw Chemical Co.*, who talked on "Lead Plating." Mr. Beall discussed the principles of the fluoborate and fluosilicate baths and the respective advantages and disadvantages of the deposits obtained from these solutions.

In the business session of the meeting, *Membership Chairman John Sunderhaus* and *President Emmette R. Holman* officiated at the initiation of five candidates for active membership. These included *Al Larson, Collings Engineering Co.; C. B. Spence, Spence Plating Co.; Charles H. Wells* and *George Coobrough*, plating supervisors at *North American Aviation Corp.*, and *Leo Brame of Thompson Products Co.*

Society of Automotive Engineers

Ellis W. Templin, automotive engineer of the Los Angeles Bureau of Power & Light, rendered a report at the recent West Coast transportation meeting of the Society of Automotive Engineers which was based on information gathered in a nation-wide survey on various angles of repair of automotive parts by metal spraying methods. His report touched upon engine bearing replacement technique in the use of copper, cadmium and tin; restoration of crackshaft diameters by the application of metal by spraying; metal coating techniques, and hard surface applications and techniques.



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News from California
By FRED A. HERR

Atlas Galvanizing Co., formerly at 4636 Pacific Blvd., Vernon, has completed a new plant and office building on Leonis Blvd., a quarter block east of Pacific Blvd. The building is a one story cream stucco office structure fronting on Leonis Blvd., rising to 1½ stories in the rear, where it connects with a V-sky-lighted one story shop building.

The fence which surrounds the factory yard is clever advertising consisting of five foot high sheets of galvanized iron with the grooves running vertically and attached in 20 foot panels to the fence posts.

For the duration of the war, *Harold J. Kroesche* has discontinued operation of the *Catalytic Chemical Co.* which he established in partnership with Attorney *H. C. White* in Los Angeles about a year ago. He has joined the *All-American Manufacturing Co.* in the capacity of chemical engineer. The All-American Co. operates a large metal finishing department for cadmium, nickel and zinc work on steel aircraft parts and tools and is engaged 100% in war work.

Prior to establishing the Catalytic Chemical Co., Kroesche had a long period of service as sales engineer for the *A. J. Lynch Co.* at Los Angeles.

Roger Sundmark, formerly head of the *Sundmark Supply Co.* of Los Angeles, has assumed the superintendency of the plating and finishing department for the *Norris Stamping & Manufacturing Co.*, 5211 East Boyle Ave., Vernon. Under the impetus of war, the Norris Co. plating room has grown into one of the largest in Southern California for metal finishing of shell cases and metal shell holders. Development of the shop into all-out production of shells was due in some extent to the fact that the company in pre-war days produced a small amount of shells for the government in addition to its major work at that time in turning out license plates, desk plates and novelties.

The full automatic setup for dipping brass shell cases now occupies an area nearly a full block long and includes literally dozens of plating and cleaning tanks and numerous items of auxiliary equipment which go with a plant that size.

Sundmark had charge of the electroplating supply department of the *Kelite Products Co.*, Los Angeles, prior to the time he established the Sundmark Supply Co. with his brother, Walter, who since then has entered the armed service.

A full automatic setup comparable to the one operated by Norris Stamping & Manufacturing Co. is now in operation by *Bowers Manufacturing Co.*, 7600 Avalon Blvd., Los Angeles, for use in finishing ring tops and shell cases. The Bowers installation consists of a full automatic 8,000 gallon bright nickel tank, a 5,000 ampere generator, a 2,000 ampere rectifier, and auxiliary equipment.

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William J. ("*Jack*") *Wiseman* has resigned as foreman of the *Faith Plating Co.*, 7141 Santa Monica Blvd., Hollywood, and is now director of metal finishing for the *Harwood Manufacturing Co.* of Los Angeles.

The Harwood Co. makes electric couplings for planes and tanks. It has no plating department of its own but sub-contracts all such work to local independent shops. Faith Plating Co. is doing the nickel and cadmium work; *Los Angeles Plating Co.*, the zinc work and part of the silver work, and *Boyles-Snyder Co.*, also of Los Angeles, which has specialized in silver plating of hotel and home silverware as well as band instruments and ecclesiastical ware for a number of years, is handling some of the silver finishing for Harwood Co.

Wiseman came to Los Angeles from Grand Rapids, Mich. in 1940, after serving as plating superintendent for the *Grand Rapids Plating Co.* for many years. At one time (1939-40) he had the distinction of holding membership simultaneously in three branches of the A. E. S.—Grand Rapids, Detroit and Toledo. This was due to the nature of his job at the time, for, acting as trouble-shooter in plating problems for the Grand Rapids Plating Co., he traveled continuously and usually attended the A. E. S. session in the city he happened to be in on meeting night. Wiseman represented the Grand Rapids firm on plating problems in such plants as the *Standard Sanitary & Plumbing Co.* of Louisville, Ky., the *General Motors Co.*, Detroit, and other large companies. He has been a member of Los Angeles Branch of the A. E. S. since 1940.

Frank Rushton of Los Angeles, has returned from a business trip to San Francisco and Oakland in the interest of *La-Salco, Inc.*, St. Louis plating equipment manufacturer, for which he serves as west coast representative.

F. E. Olds & Sons, Inc., band instrument manufacturer, 1710 West Washington Blvd., Los Angeles, has resumed work on Army contracts for trumpets and other horns on which work was halted by the government early this summer. The current contract supplements a 1,000 lot order for silver and brass horns which the Olds Co. completed for the Army earlier in the year.

The company has also done considerable work on altimeters and other plane parts. Its plating room is equipped for anodizing, copper, gold, silver, nickel, cadmium and chrome work. The firm also repairs privately owned band instruments which call for chrome plating trombone slides and nickel plating cornet and trumpet valves and trumpet pumps.

Plating room foreman of F. E. Olds & Sons, Inc., is *Joseph Sunderhaus*, vice-president of Los Angeles Branch of the A. E. S., who is quite adept at picking out Olds-made and Olds-plated horns in passing military bands. At a recent baseball game in Hollywood Park at which Ted Lyons and Red Ruffing, former pitchers for the Chicago White Sox and New York Yankees, opposed each other on the mound for service teams, Mr. Sunderhaus was able to point with pride to the fact that most of the brass horns used by the two service bands had originated in the shop of which he is the foreman.

Adell Precision Products Co., 10,777 Van Owen St., Burbank, Calif., is converted over 100% to war work, being active chiefly on hydraulic parts for airplanes. According to *Arlie Morgan*, plating superintendent, metal finishing work in the plant includes copper, cadmium and anodizing, but the firm does no hard chrome work The company recently completed two new factory buildings.

Friends and associates of the late *Frank Salaba*, formerly traffic manager for the *Philadelphia Quartz Co.* at San Francisco, are paying tribute to the splendid work he performed among the young people of the Bay District by establishing the Frank Salaba Memorial Fund.

Salaba devoted a great deal of his spare time to the religious and physical education programs for young people. Sponsoring the Salaba Memorial Fund Drive is a committee composed of admirers of Salaba's work in the Oakland-Berkeley area. The committee consists of *Sue J. Irwin, W. W. Osborn, H. H. Sackett, Harold Ferguson* and *George D. Cron.*

Now busy on all-out production of multi-contact electrical connectors for aircraft, tanks, PT boats, Signal Corps radio and other uses, the *Cannon Electric Development Co.* of Los Angeles has built up so ex-

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PERMAG Ferro-lyte

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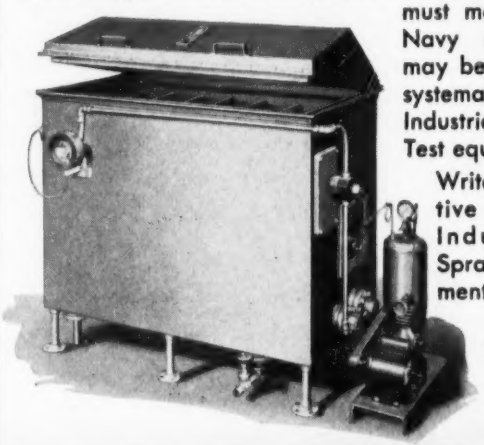

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ensive a plant for production of those items that it is looking forward to the close of the war with confidence and is already making post-war plans. Indicative of the expansion this firm has experienced is the increased size of the plating room, which has quadrupled in less than two years.

While the electrical connector used in aircraft has been a comparatively recent development, the Cannon Co. manufactures several other types which are not related directly to war products. With increased production facilities built up since Pearl Harbor, the firm will again go into full scale production of connectors for electronic, low level circuits, radio and telephone units, power and heavy duty circuits, hospital signal systems and experimental switchboard plugs.

A welding flux developed by the Solar Laboratories of the *Solar Aircraft Co.* of San Diego for the specialized welding of stainless steel and other high alloy metals has now been made available to other aircraft producers.

Originally the flux was intended for use only in Solar's own plants, where it met the exacting requirements which have given the firm a wide reputation for producing stainless steel and anti-monoxide airplane exhaust systems. However, as the flux contributed to better welding and faster welding production, other airplane manufacturers desired to make use of it. Production facilities for the new flux have been set up in San Diego by the Solar Co. and distribution will be on a country-wide basis.

Rheems Manufacturing Co., 4361 Firestone Blvd, Los Angeles, is erecting a new factory building at a cost of approximately $19,000. The firm recently acquired considerable new anodizing equipment from *Pacific Fabrication Co.* for use in anodizing airplane motor cowlings, bomb doors and other plane parts, which now constitute the bulk of its production.

Western Electrochemical Co. is completing a factory alteration program at its headquarters, 2650 E. Washington Blvd., Los Angeles, at a cost of $2,000.

U. S. Flare Corp. is preparing plans for construction of three assembly buildings at 12,300 Montague St., San Fernando, Calif.

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Business Items

Lee S. Sinclair Jr. has been appointed to the laboratory staff of *Kelite Products, Inc.* He will work at the main plant in Los Angeles.

Mr. Sinclair was formerly in charge of the Maytag Company's laboratory in Newton, Ia., and is a chemical engineering graduate of Iowa State.

The Porcelain Enamel & Manufacturing Co., Baltimore, Md., has had its corporate title changed to *Pemco Corporation.* The change was brought about to embrace the new scope of the company's interests.

T. Shriver & Co., Inc., Harrison, N. J., has announced that on October 1st the firm was incorporated under the laws of the State of New Jersey. In assuming corporate status, no material change in ownership control or in the management of the company is involved. The company will continue to manufacture filter presses, pumps, etc.

George L. Nankervis Co., 5408 Commonwealth Ave., Detroit, Mich., announces the appointment of *Edward F. Berry Co.*, 6432 Cass Avenue, Detroit, Mich., as an addition to its list of distributors.

In the electroplating plant of the *Chicago Plating Co.*, 1714 W. Division St., Chicago, plating of war products goes on continuously around the clock. The faster production schedules are being met by the use of a new process of electroplating known as the Promat Process.

Mr. A. L. Pietrowicz, in charge of technical development, states production has been more than doubled. "The Promat Process," he says, "gives better anode characteristics and greater cathode efficiency. The results are self-evident — a finer grain deposit and brighter finish are readily obtained."

A new and unique use is made of alternating current. A motor-driven generator supplies direct current to the Promat Power Unit which, in turn, produces an asymmetrical alternating current. This current is used as a power source with specially prepared high speed zinc plating baths. Both No. 90 and No. 99 Promat Processes are used.

A technical booklet illustrating and fully describing this new process may be obtained free by electroplaters by writing the Promat Division of Poor and Company, Dept. MF, 851 S. Market St., Waukegan, Ill.

Joseph Novitsky, plating rack manufacturer, has moved to new and larger quarters effective October 29. After that date, the factory will be located at 147-24 Liberty Ave., Jamaica 4, N. Y. (Telephone: Republic 9-7223) and the office will be at 104-17 199th St., Hollis 7, N. Y. (Hollis 5-6871).

Stockholders of *The Procter & Gamble Company* at the annual meeting held October 13th in Cincinnati, elected *Neil H. McElroy*, manager of the company's advertising and promotion department, to the board of directors. He was subsequently elected by the directors to the office of Vice President in Charge of Advertising and Promotion.

Mr. McElroy joined the company in 1925 as a mail boy and following a succession of positions in sales and advertising, he was placed in charge of the company's sales promotion activities in 1929. His work in this field led to his appointment in 1940 to head of the advertising department.

Frederick V. Geier, Cincinnati industrialist and president of *The Cincinnati Milling Machine Co.*, was also elected to the board, bringing its membership up to 14, the full number provided for in the company's Code of Regulations.

In addition to Mr. McElroy, the following officers were elected by the board: *Richard R. Deupree*, president. *Renton K. Brodie*, vice-president. *Ralph F. Rogan*, vice-president. *Floyd M. Barnes*, vice-president in charge of purchases; *Harvey C. Knowles*, vice-president in charge of manufacture; *Thomas J. Wood*, vice-president in charge of sales. *Kelly Y. Siddall*, comptroller; *H. Truxtun Emerson*, secretary; *Guy B. Taylor*, *William H. Watters* and *Lowe H. Wiggers*, assistant secretaries: *Walter H. Tuttle*, treasurer; *George S. Woodward, Jr.* and *John W. Friend*, assistant treasurers.

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Personals

Warrant Officer Al Baker

Al Baker of *M. E. Baker & Co.*, Cambridge, Mass., was home during October on a 30-day leave from naval service in Dutch Harbor, Alaska. His rank had been increased to that of warrant officer.

The Baker family is also celebrating the birth of Ann's 8¼ pound daughter on October 29th. *Mr. and Mrs. Louis Love*, the baby's parents, have named her Martha Frances.

Mr. and Mrs. Willoughby G. Sheane (*Bill Sheane* is our Organic Finishing editor) have announced the birth of a daughter, Genevieve Lee, on September 23.
The baby weighed 8¼ pounds.

As we go to press there is sad news of the death on November 1 of George Spencer of the Crown Rheostat & Supply Co., Chicago. The December issue of *Metal Finishing* will carry more complete details.

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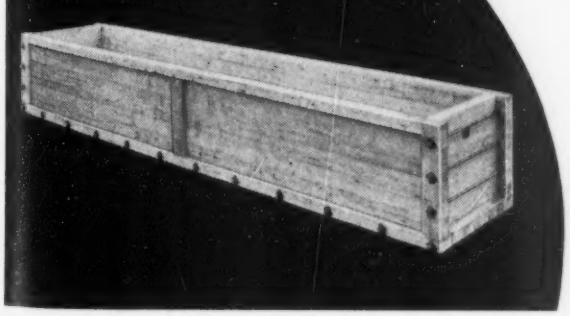

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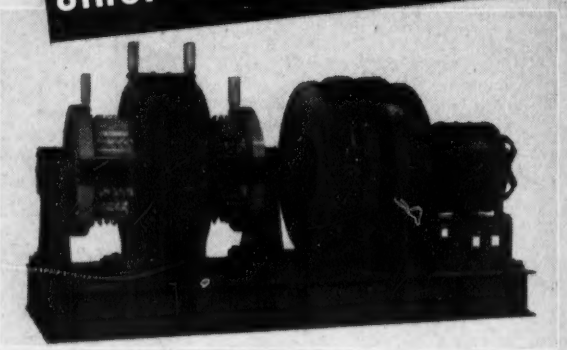

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NOVEMBER, 1943

ORGANIC FINISHING

SECTION OF METAL FINISHING

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ORGANIC FINISHING

SECTION OF METAL FINISHING

NOVEMBER, 1943

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Cover Photograph

A two-quart tank unit being used to spray air conditioning units.

Courtesy Eclipse Air Brush Co.

Luminous Paints

During a recent discussion on the uses of organic finishing materials formulated with substances to glow in the dark, we were taken to task by one of our physicist friends who objected to the loose use we made of the terms luminescence, phosphorescence and fluorescence. We were informed that a material which glows with a light of its own—except as the result of high temperature which produces incandescence—is said to be luminescent. In some instances luminescence is due to chemical reaction as in the case of the slow oxidation of cold phosphorous which is accompanied by the evolution of visible light.

On the other hand, phosphorescent and fluorescent materials glow as the result of being exposed to light, usually of a color different from the light emitted. In the case of phosphorescent materials the glow continues for an appreciable time after the source of excitation has been removed. The glow from fluorescent materials, however, continues for only a very short time, no more than a very small fraction of a second and too short a time to be perceptible.

To know the differences between the various types of cold light as they are popularly known is, of course, important. Of more importance to the finishing industry is the fact that materials which glow (without being heated) are usually applied as a coating, that is, they are incorporated into a vehicle so that they may be handled easily and protected after application. It is certainly the most logical and convenient way to use them.

We are all familiar with some of the uses of so-called luminescent paint. Luminous watch dials and electric switch dots are two of the most common. There are many other possible and actual uses, both industrial and domestic. The subject is being given increased study and we believe that the manufacture and application of luminous paints will come to have an important place in the finishing industry.

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NEWS FROM WASHINGTON—

By George W. Grupp
METAL FINISHING'S Washington Correspondent

Acetone and Diacetone Under Control The solvents acetone and diacetone were placed under allocation control by the issuance of Allocation Order M-352 on September 28, 1943. A customer applying for not more than 350 pounds of acetone or not more than 415 pounds of diacetone in a month must file a purchase order with the supplier. No person may accept delivery from all suppliers of more than 1,750 pounds of acetone or more than 2,075 pounds of diacetone in a month without specific authorization.

Industrial Alcohol Requirements for 1944 Walter G. Whitman, assistant director of the Chemicals Division of the WPB, presented to Senator Gillette's Committee on Utilization of Farm Crops on October 14, 1943 an estimate of industrial alcohol supplies and requirements for 1943 and 1944. He estimated the domestic production at 450 million gallons in 1943 and at 590 million gallons in 1944. He said the requirements were 410 million gallons in 1943 and 640 million gallons in 1944. The increase in 1944 requirements, he declared, will be due to the synthetic rubber program which it has been estimated will require 330 million gallons in 1944. New alcohol plants which are expected to be completed this winter will increase domestic production by 80 million gallons when in full operation.

Japan's Alcohol Increase Japan has increased her supply of alcohol for war uses by making it from taiwan sugar and sweet potatoes. Plants for this purpose were built on the island of Formosa.

Butyl Alcohol OPA Order For the purpose of enabling producers of butyl alcohol and butyl acetate to accumulate inventories of country corn, Amendment No. 9 to Maximum Price Regulation No. 37 was issued on October 4, 1943. Corn is the basic raw material for these solvents which are used in the manufacture of lacquers and paints.

Castor Oil for Protective Coatings The improved position of castor oil and phthalic-alkyd resins containing castor oil has resulted in an easing of the restrictions on these products since October 1, 1943. This policy was established to permit manufacturers and users of phthalic-alkyd resins greater flexibility in producing protective coatings under Order M-139 which will also approve phthalic-alkyd resins containing oiticica oil for aircraft coatings. This ruling was established in cooperation with the War Food Administration for the purpose of aiding resin and coating manufacturers in producing aircraft coatings where tung oil-alkyd resins will not be permitted after November 30, 1943 because of the acute tung oil situation.

Chile's Imports of Oils, Paints and Chemicals Reports from Chile during the past month reveal that her imports of industrial oils, paints and chemical products amounted to 96,304,700 pesos in 1942 as compared with 75,805,000 pesos in 1941. On the other hand Chile's exports of chemical and other manufactured products (not including iodine and nitrates) totaled 9,948,000 pesos in 1942 as compared with 9,834,000 pesos in 1941.

Diphenylamine's New Order Preference Order M-75, which governs diphenylamine, a chemical used in the making of resins, plastics and protective coatings, was retitled "Allocation Order M-75" and revised on September 30, 1943 to provide for the use of Forms WPB-2947 (formerly PD-602) and WPB-2945 (formerly PD-602) by customers using 5,000 pounds or more of this chemical a month. Certificates of intended use are required from customers using from 50-5,000 pounds a month. No authorization is required for use or acceptance of delivery of 50 pounds or less a month.

Ethyl Acetate Price Adjustments Permitted The Office of Price Administration issued Amendment No. 11 to Supplementary Regulation No. 15 on October 1, 1943 to authorize price adjustments of ethyl acetate producers who were unable to operate under the previously existing ceilings and to stimulate the expansion of production of this commodity. Applications for adjustment must be made according to the provisions of Revised Procedural Regulation No. 1.

Glycerin Goal in Canada A current report reveals that Canada is planning a salvage campaign to attain her goal to produce about 35,000,000 pounds of glycerin in 1943.

New Linseed Oil Ceilings Amendment No. 3 to Revised Supplementary Regulation No. 14 of the General Maximum Price Regulation issued on September 25, 1943, set the prices on maximum linseed replacement oil at $1.12 a gallon in tank cars; at $1.15 in car lot drums; at $1.13-$1.15 in tank wagons; at $1.16-$1.19 in lots of 10 drums or more; at $1.18-$1.21 in lots of 5-9 drums, and 1.20-$1.23 in lots of 1-4 drums.

Maleic Anhydride and Maleic Acid Under Control Maleic anhydride and maleic acid (which are used in the manufacture of synthetic resins), were placed under Allocation Control Order M-214 as amended September 24, 1943. The amended order provides for the exemption of a monthly use or acceptance of delivery of not more than 700 pounds of phthalic anhydride, 500 pounds of maleic anhydride, and 200 pounds of maleic acid. Suppliers are to make application on Form WPB-2946 (formerly PD-601). Applications for authorization to use and accept these chemicals must be filed on Form WPB-2945 (formerly PD-600).

Monomethyl Ether Under Allocation Monomethyl ether of ethylene glycol and monoethyl ether of ethylene glycol (chemicals used as lacquer solvents), were added to the glycol ethers under allocation by amending Order M-356 on October 4, 1943. Specific authorization will not be required for the delivery by any supplier to one person in one calendar month of not more than 430 pounds of monomethyl ethyl of ethylene glycol or not more than 410 pounds of monoethyl ether of ethylene glycol.

Use Paint Containers With Care J. Newton Hall, transportation officer of the WPB's Chemicals Division, has started a campaign urging all consumers of paints to handle all returnable paint containers with more than usual care because damaged metal containers are not replaceable, and because new containers are being made of less durable material and are easily damaged.

United Kingdom's Shellac Supply Sufficient The shellac supplies of the United Kingdom are sufficient for her needs for a year, according to the British Ministry of Supply.

Shellac Prices Rise in India Due to a rise in the cost of manufacturing, the British Ministry of Supply has entered into an agreement with the government of India to permit an increase of price of 7 rupees per maund (one maund equals 82.28 pounds) on shellac and 2 rupees per maund on seedlac.

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Stanley Chemical

Resin Emulsion Paints

By W. H. BUTLER

Bakelite Corp., Development Laboratories, Bloomfield, N. J.

THIS article is intended as a review to acquaint the reader with recent developments in resin emulsions, some of the factors which should be considered in handling these products, and their specific application. All paints which contain a binder and a pigment and are water-reducible look alike on casual examination. They are, however, not all the same. Water-reducible paints may be broadly divided into two groups. The first group includes the paints based on water-soluble colloids and the second, those based on true dispersions of the water-insoluble type.

Coatings Based on Water-Soluble Colloids

The use of water paints is as old as the decorative arts. The ancients, even prehistoric man, made use of naturally occurring water-soluble colloids as binders for crude earth colors. Numerous types of powder or paste paints, reducible for application with water, are available today. They vary in degree of water resistance or washability and, in general, are used only for interior finishing where moisture conditions are controlled.

In preparing powder paints of this character, pigments are mixed with binders, such as casein, soy protein, animal and vegetable glues, or other water-soluble colloids, and certain chemicals are added to render the colloids less soluble. Preservatives also are included to protect the paint film against bacteria and fungi.

Water paste paints are based on casein or soy protein dispersed by alkali or borax under controlled conditions and modified with drying oils or other water-insoluble film components. These paints are usually more durable than the powder paints. With both types many different chemicals have been used and recommended to reduce water solubility of the colloid binders. Although these elements increase washability enough so that painted surfaces can be cleaned with a damp cloth, such paints withstand weathering poorly. For this reason they are not suitable for exterior use. For interior service, however, they offer important advantages. They can be made to yield high hiding power for single coats, can be applied on damp plaster, hold out well on porous surfaces, dry rapidly, and are reasonably free from odor since they contain no organic solvents.

Unfortunately, their disadvantages are equally substantial and more numerous. Their water resistance durability is low and under certain conditions of dampness the coatings will scale. Due to surface shrinkage of the colloid film, their initial adhesion is poor and on some surfaces, such as an oil paint base, they may peel soon after application or dampness may cause mildew and destroy the film.

In general, these paints are limited to application on porous surfaces such as plaster, stucco, composition panelling, etc., as they require this anchorage in order to retain adhesion. They are not usually used over glossy paint films or non-porous surfaces or on a metal base because of this property of poor adhesion. For this same reason, they are not used as a clear coating or in high gloss finishes but are usually supplied in highly pigmented finishes in which the pigment tends to give some protection to the binder and improve the adhesion. Thus, their field is somewhat limited. Nevertheless, the value of their good points is considerable. If these could be retained, perhaps strengthened, and if at the same time the disadvantages mentioned were eliminated, a great increase in the use of water paints for outdoor as well as indoor service would follow. All of this is being accomplished rapidly through the development and application of resin emulsions based on synthetic resins for the production of new and greatly improved types of water paints.

Water-Insoluble Vehicles for Resin Emulsion Paints

A wide range of vehicles can be used for the production of resin emulsion paints and the range of vehicles with specific types of resins is possibly as broad as the range of spirit-soluble types which are now available for finishing applications. There are, however, certain limitations which preclude the use of all types of resins for resin emulsions. The type of vehicles which can be used might be classified as follows:

1. Phthalic alkyds.
2. Non-conjugated drying oils.
3. Long oil type, non-conjugated drying oils. This type would include drying oils processed with resins such as ester gum, Cumar, and natural resins, etc., or the more durable type based on phenolic resins.
4. Copolymers based on oil-reactive ester resins and non-conjugated drying oils.

It is the last type which will be covered in more detail as this type can be easily dispersed in water in equipment available in most paint and varnish plants. The oil-reactive ester resins are based on acids such as bicycloheptene dicarboxylic acid and represent a recent development in resins for protective coatings. The liquid resin ester may be considered analogous to the alkyd type and is available as a relatively low polymer. The low polymer ester resin is potentially reactive and, when heat-processed with conjugated or non-conjugated drying oils, a reaction takes place which yields a viscous liquid product known as the copolymer. Through this simple reaction it is possible to produce a wide

range of copolymers from available non-conjugated drying oils, such as linseed oil, soybean oil, fish oils, etc. These copolymers have properties of rapid polymerization under heat, quicker air-drying, improved chemical and water resistance, and stability to oxygen at elevated temperature.

Production of Resin Emulsions

The progress of resin emulsion technique has greatly expanded due to (1) the development of new vehicles which can be easily dispersed in water to obtain stable, durable emulsions, (2) the development of new chemical emulsifying and wetting agents which reduce surface tension of these vehicles and facilitate dispersion in water, and (3) improved water-soluble colloids for stabilizing the emulsions. A combination of these three factors makes it possible to produce resin emulsions in equipment available in most paint and varnish factories, such as a pony mixer or simple mixing equipment. The use of a colloid mill is not required to obtain the dispersion in water although the paste type colloid mills can be used to advantage to disperse the pigments in the emulsion. The choice of vehicle will depend upon the individual supplier and the ability to utilize new materials and technique in the production of new materials.

Resin Emulsions Based on Oil-Reactive Ester Resins

Utilization of suitable oil-reactive ester resins for production of resin emulsion paints is not difficult. The vehicles for the emulsion are produced by copolymerizing the drying oil and oil-reactive ester resin in a standard varnish kettle. As no solvent is used, they are heat-processed to a definite viscosity and water-cooled.

Dispersion in water is accomplished by simply mixing in a pony mixer for 30 minutes to one hour. These emulsions will stand infinite dilution with water and will not break on five or more cycles of alternate freezing and heating to 160°F.

Pigments can be dispersed in the resin emulsion by mixing in a pony mixer or by coarse grinding in a roller mill. Ball mill grinding should not be used. A wide variety of pigments can be employed. As the emulsion has a pH of 8.0 to 9.0, pigments should be selected which are not affected by this alkalinity. The resin emulsions can be formulated to high-pigment volume. They air-dry rapidly, can be applied by brush or spray, and have a very faint, pleasant odor.

The resistance to water is indicated by air-drying the film for five days, soaking the coated panel in water for five days, then testing for wet abrasion. No apparent film is removed up to 4,000 strokes.

Durability of these films is very great. After 2,000 hours of accelerated weathering, the only sign of failure is a slight chalking. Adhesion is excellent over aged paint, metal, brick, and other surfaces. Since the films dry by polymerization after evaporation of the water phase, no surface shrinkage occurs.

As to cost, use of water as a thinner constitutes a decidedly important saving which is not lost by the necessity of using stabilizers and emulsifying agents.

Insufficient data are available as yet regarding shelf-life, but results of tests of package stability on aging and exposure to a wide range of temperatures appear favorable.

Probable Types of Dispersions for Coating Application

Under this consideration are included the oil-in-water type and the water-in-oil type dispersions. These may be listed as follows:

(1) Oil-in-water type—dispersed in water and water reducible. This type contains no organic solvents.

(2) A vehicle containing no water or organic solvent which yields the oil-in-water type dispersion on reduction with water.

(3) The third type may be classified as bordering on the entirely theoretical, and would be a vehicle containing no water, which is reduced with a non-polar organic solvent and is further reducible with water to yield the oil-in-water type dispersion.

(4) The fourth type is a vehicle containing a low percentage of water and a major percentage of organic solvent which yields the oil-in-water type dispersion on reduction with water and which will tolerate addition of organic solvent.

(5) The fifth type is a vehicle which yields the water-in-oil type dispersion on addition of water and which is reducible with organic solvents.

In the April 10, 1943 issue of *Chemistry & Industry*, Mr. P. F. Timson in a letter to the editor suggests that the use of the terms "oil-in-water" and "water-in-oil" emulsions might be leading to mental fatigue and offers the suggestion that such terms as "water-continuous" for the "oil-in-water" and "oil-continuous" for the "water-in-oil" might be more generally acceptable descriptions for the emulsion types. The writer agrees that these are much better terms.

The five probable types of vehicles having been defined and classified, certain factors which affect the dispersion of these vehicles should next be analyzed and discussed.

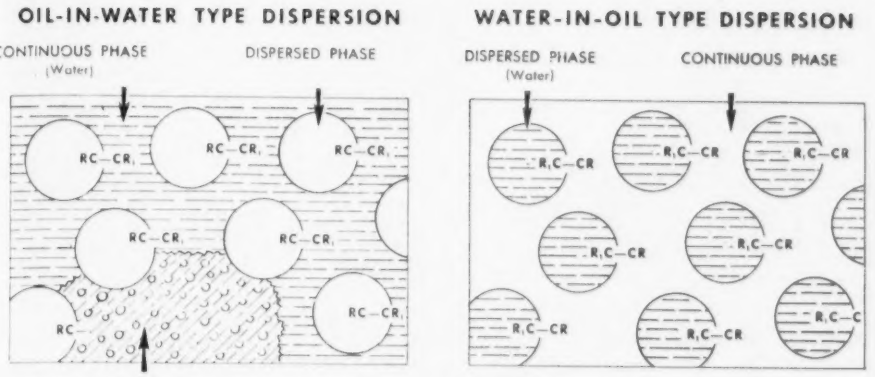
Surface Tension and Dispersion

Resin emulsions are essentially a two-phase system, one phase of which is dispersed, the other phase remaining insoluble in the dispersed phase. The most important considerations to obtain this dispersion are: (1) The surface tension of the vehicle which determines its property of dispersing the vehicle in the required phase and also determines the particle of this phase. (2) The stability of the system after dispersion.

It is to be noted that when 1 cubic centimeter of material is reduced to a number of smaller cubes, 0.1 and 0.01 mm., the total surface resulting from this division becomes 600 and 6,000 sq. cm. and the increase in number of particles is 1 to 1 million and 1 to 1 billion, respectively. Oil-in-water type dispersions range in this region of particle size.

The importance of having this large contact area is demonstrated in the production of high polymers by emulsion polymerization. In processes of this type, monomers are dispersed in an aqueous medium and catalysts such as hydrogen peroxide, benzoyl peroxide, etc., are added to the water phase. An example of this type of polymerization occurs in the production of synthetic rubber from butadiene and styrene.

This particle distribution will indicate not only the surface energy which must be overcome in order to obtain



Water soluble colloids are used to stabilize the dispersed phase.

R,C—CR = Emulsifying agent.

CR_1 = Polar group (soluble in water) — amine or alkaline base such as ethylene diamine, morpholine, or ammonia.

CR = Nonpolar group (soluble in oil) — long chain fatty acids such as linseed, oleic, etc.

the dispersion but also the surface which must be stabilized in order to hold these particles apart and prevent coagulation or breaking of the emulsion. For this reason, it is important to choose a vehicle having low-surface tension or adopt the alternative of using a high percentage of emulsifying agent or chemical wetting agent.

Factors to be Considered in Development of Continuous Films Having Adequate Adhesion

As oil-in-water emulsions are made up of billions of small particles dispersed in water, it becomes necessary for these particles to flow together when the aqueous phase evaporates in order to obtain a continuous film with adequate adhesion. It is also necessary that this film, which is initially in a liquid or tacky condition, oxidize or polymerize to a dry, non-tacky film in a reasonable time and that this conversion be irreversible so that the film will be permanently insoluble in water after polymerization takes place. In order to obtain this required flow and tackiness the vehicle must be used within a definitely controlled viscosity region. Also, the surface tension becomes a factor in that it must allow the particles to flow together on evaporation of the continuous phase. Other factors which also must be considered in dispersions are the following:

(1) Emulsifying and Wetting Agents

As an aid to dispersing the vehicle, emulsifiers possessing certain properties inherent in their molecular structure must be used. One end of each molecule of such emulsifiers contains a non-polar group that is soluble in the vehicle, for example—fatty acids, or the acid component of the resin. The other end of the molecule consists of a polar group which is soluble in the water phase. Due to this structure these emulsifying agents have the property of lowering the surface tension of the vehicle. There is a wide range of emulsifying agents which may be divided into two groups: (a) Emulsifying agents in which the polar group evaporates from the film. This type is usually classed as a volatile emulsifying agent. In this group are amines, ammonia, etc. (b) Emulsifying agents which are non-volatile. Emulsifying agents of this type remain in the film.

It is generally considered that the volatile type emulsifying agent is most effective for maximum water resistance and film integrity because the non-volatile type can act to reverse the insolubility if later exposed to water.

Wetting agents also function to lower surface tension. They are added as an aid to the emulsifying agent or may function alone as a dispersing agent. As stated, their specific function is to lower surface tension. The functional powers of the wetting agent derive from their molecular structure in the same way as do those of the emulsifying agent, that is, one end of the molecule is a non-polar group soluble in the non-aqueous phase and the other end is a polar group soluble in the water phase.

(2) Stabilizers

Under stabilizers are classified those products which operate to hold the dispersed film-forming phase in suspension over an extended period, particularly the required shelf-life of the vehicle. With the oil-in-water type dispersion, the stabilizer acts to keep the dispersed phase or vehicle particles from coagulating. They do this either by coating the individual particles, as do the water-soluble colloids, or by separating the particles, which the pigments or clays probably do also. It is likely that a good stable system may require both functions.

It is generally believed that water-soluble colloids are required as stabilizers for the oil-in-water type, for the water-in-oil type water-soluble colloids are usually not essential to dispersion stabilization. In fact, addition of water-soluble colloids in such instances tends to reverse the phase to the oil-in-water dispersion.

(3) Pigmentation of Resin Emulsions

As previously stated, proper choice of pigments will help to stabilize resin emulsion paints and it is possible through proper use of specially prepared grades of clay, in conjunction with high-strength pigments, to build very stable emulsions from dispersions which might be considered of doubtful stability. Inorganic materials such as bentonite have been used for a number of years as an aid to dispersion of vehicles in water.

Considerable progress is being made in the development of new pigments for resin emulsions.

Application of Resin Emulsions

An indication of the use of resin emulsions is shown by the following specifications:

(1) Navy Department, Bureau of Yards and Docks. (June, 1942). Typical specification No. P-2-a. "Paint; Camouflage, Resin-Oil Emulsifiable Type."

(2) Navy Department, Bureau of Yards and Docks. (December, 1942). Typical specification No. P-5, "Paint; Camouflage, Resin Emulsion, Paste Type."

(3) Federal specification TT-P-88, (December 27, 1940), "Paint; Resin-Emulsion, Interior, Paste Light-Tints and Whites."

(4) U. S. Army Engineers, tentative specification T-1279B., "Paint; Camouflage, Oleoresinous (Emulsifiable)."

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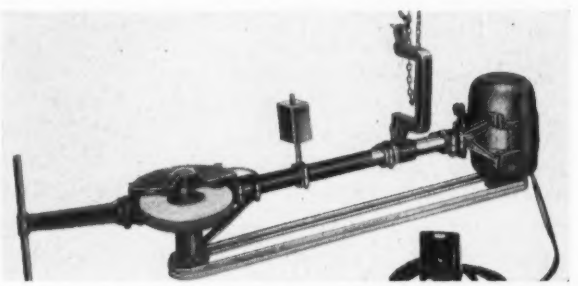

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These four specifications cover the major uses for camouflage paint. There are other specifications in process which will, no doubt, cover resin emulsions for other applications such as traffic paints and metal finishing.

The major work on resin emulsions has been for production of lusterless finishes and the water-continuous type emulsions are very applicable because of the ease in dispersing the pigments in the water phase. Because of the high pigment volume used in the lusterless type, the films dry very rapidly—usually in about 15 to 30 minutes. As the war application requires lusterless finishes for most exteriors, there has been very little development work on resin emulsions for semi-gloss and gloss finishes but this type can be produced. One supplier has a line of resin emulsion semi-gloss and gloss finishes which will be released for civilian use when raw material restrictions are removed. Another producer also has developed a gloss finish for military use for metal finishing.

Pigmented resin emulsion finishes can be applied on most surfaces but are more applicable for porous surfaces or one-coat application with the lusterless finish. For use on bare wood, the wood should be primed to prevent lifting of the grain, although the camouflage paints are used directly on wood without priming in some cases. For direct application on metal, the metal should be chemically treated or primed prior to application of the resin emulsion finish. Development work is in progress on pigmented resin emulsions for application on metal without previous chemical treatment. At least one type of clear emulsion can be applied on clean, polished sheet panels and yield a continuous, glossy film without any evidence of surface rusting during application.

In conclusion, it may be stated, that a great deal of the progress in resin emulsion finishes has been due to the cooperation of the Technical Groups has been for the production of lusterless of the Paint and Varnish Production Clubs and their National Federation Technical Committee. The departments of the government responsible for camouflage and protective coatings have also aided the program. When military needs have been taken care of, there should be an expanding use of resin emulsion finishes for civilian requirements.

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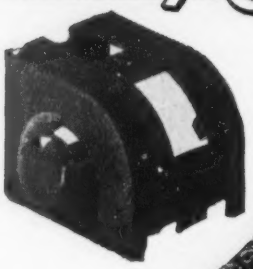

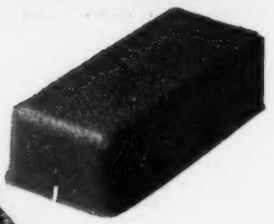

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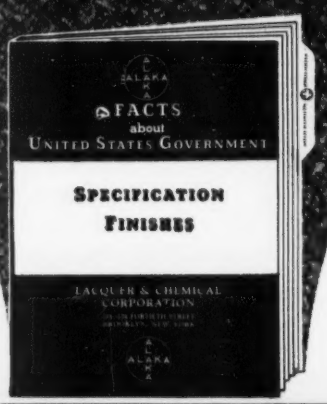

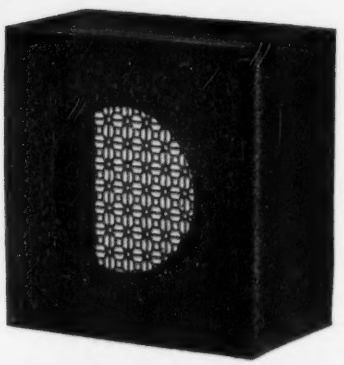

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Painting of Steam and Hot Water Radiators

The following discussion on painting steam and hot water radiators, issued in Letter Circular LC 445 by the National Bureau of Standards, is presented here as an authoritative answer to questions concerning the relative merits of various types of finishes for radiators. The practical information given will be found most useful.—Ed.

FOR a number of years the subject of painting radiators has received considerable attention from the public and it is apparent that the essential facts have not always been understood. The object of this discussion is to supply the more important facts in the case.

It will appear that as far as their effect on the performance of radiators is concerned, paints fall into two classes: first, those in which the pigment consists of small flakes of metal, such as the aluminum and bronze paints most commonly used for painting radiators, which produce a metallic appearance and will be called metallic paints, and second, the white and colored paints in which the pigment consists not of the metals but of oxides or other compounds of the metals. Thus, white lead paints or those containing compounds of zinc or other metals will be called non-metallic paints. These non-metallic paints are obtainable in practically all colors and white and black, while the metallic paints have the color of the metal or alloy of which the flakes are composed.

We will state at the outset the principal conclusion, which will be explained in more detail later, that the last coat of paint on a radiator is the only one which has an appreciable effect and that a radiator coated with metallic paint will emit less heat, *under otherwise identical conditions*, than a similar radiator coated with non-metallic paint. In order to obtain the same amount of heat from the two radiators just considered, the temperature of the one painted with metallic paint must be somewhat higher. Under these conditions, exactly the same amount of heat is being supplied to the two radiators, and since neither the boiler efficiency nor the heat wasted in the pipe lines is appreciably affected by small changes in radiator temperatures, practically the same amount of fuel is required to supply the heat in each case. In other words, while it may be desirable for various reasons to avoid the use of metallic paints on radiators, no appreciable saving in fuel will result from the use of non-metallic rather than metallic paints.

The purpose of a heating system is to maintain the rooms in a house at some temperature higher than that prevailing out of doors. The heat which is developed by burning fuel is transferred to the rooms by means of the radiators. A radiator neither creates nor destroys heat and a large radiator, while it can put more heat into a room than a small one, must be supplied with all of the heat it puts in. In the sense that they ultimately transfer all the heat supplied into the room, all radiators are 100 per cent efficient. The word "efficiency" is, however, used in other ways, and it is now customary to use it on all possible occasions. However, it is hardly correct to say that putting metallic paint on a radiator reduces its efficiency when the effect is merely to reduce its capacity. The size of the radiators in a house can only affect the fuel required for heating by increasing or decreasing the heat wasted in transmission from furnace to radiator and that lost up the chimney. Only when the radiators are so small as to render the whole heating plant ineffective is an appreciable saving of fuel to be expected by installing larger radiators.

After these preliminary explanations, we may proceed to consider what kind of effects may be obtained by the use of various kinds of paint. The heat emitted from a radiator is removed in two ways: first, the air streaming past the radiator and rising from it is heated and carries the heat to other parts of the room, and second, the hot surface of the radiator emits heat by radiation just as glowing electric and gas heaters do. Most types of steam and hot water "radiators" emit less than half their heat by radiation and evidently the name "radiator", although universally used, is not a particularly appropriate one.

To take a concrete case, a particular sectional cast iron radiator, if painted with any non-metallic paint, might transfer into the room 180 B.t.u. per hour for each square foot of its surface, if supplied with the necessary amount of heat from a boiler. (A British Thermal Unit or B.t.u. is the amount of heat required to raise the temperature of one pound of water by 1°F.) The burning of one pound of good coal produces about 12,000 B.t.u. and, if the coal is used in a domestic heating plant, perhaps half of this, or 6,000 B.t.u., might finally be transferred from the radiators into the rooms. Most of the other half of the heat produced is inevitably lost via the chimney.

The area of one section of a cast iron radiator is about 2 square feet for the smaller sections and up to 7 or 8 square feet for the larger sections so that a 10 section radiator would have a surface area between 20 and 80 square feet.

Of the 180 B.t.u. per hour transferred, about ⅔ or 120 B.t.u. would go to heating the air which passes over the radiator. The 120 B.t.u. transferred directly to the air would not be increased or decreased by repainting the radiator. The remaining 60 B.t.u. not carried off by the air is emitted as radiant energy. The amount of radiant energy which can be emitted per hour by the hot surface is dependent upon the kind of paint used for the last coat. It was assumed that the radiator was painted with non-metallic paint. If it be repainted with a metallic paint, such as aluminum or bronze, it will no longer be able to radiate 60 B.t.u. per hour but may be able to radiate only 30 B.t.u. so that instead of transferring 180 B.t.u. to the room per hour it can now transfer only 150 B.t.u. The coat of aluminum or bronze paint is not an insulating covering like a covering of magnesia or asbestos but it has a similar effect, although for an entirely different reason. The resulting reduction in heat emission is entirely due to the reduction in the radi-

ating power of the exposed surface rather than to the insignificant insulating value of the thin layer of paint. It is therefore evident that undercoats of paint, regardless of kind, have no significant effect on the performance of the radiator except in the practically impossible case where the paint was thick enough to act as an insulating covering. In repainting a radiator it is, therefore, unnecessary to remove the old paint. The effect of adding the metallic paint is equivalent to removing 1/6 of the radiator, or nearly 17%, or as if one section out of six had been removed. Thus, a radiator of five sections painted with white or colored paint should be about as effective as another of six sections of the same kind painted with metallic paint since each would transfer the same amount of heat to the room, provided the necessary amount of heat were supplied to each.

In the following applications the numerical values given above will be used as if they were exact but it must be understood that they are merely representative and would not apply exactly to any particular case except by chance. The effect of painting on the capacity of a radiator depends upon the size and design of the radiator. The reduction in capacity produced by the application of aluminum paint is less for large radiators than for small ones, especially so in the case of large radiators having many columns or tubes per section. In a large tubular type radiator having 7 tubes per section, more than ¾ of the heat is carried away by the air directly and painting with aluminum consequently reduces the capacity of the radiator only about 10%. If only the visible portions of a radiator are painted with aluminum paint, the reduction in capacity is also obviously less than if the entire surface is covered.

Application 1. Suppose a house in which all the radiators are painted with aluminum paint has a radiator in one room that is found to be too small so that when the other rooms are warm enough, this one is too cold. If the radiator in this room is painted with non-metallic paint, either white or colored, the heat emitted by it can be increased from 10 to 20% without affecting conditions in the other rooms, although it will be necessary to burn more fuel to supply the additional heat in the one room. If the increase is sufficient the expense of installing a radiator may thus be avoided.

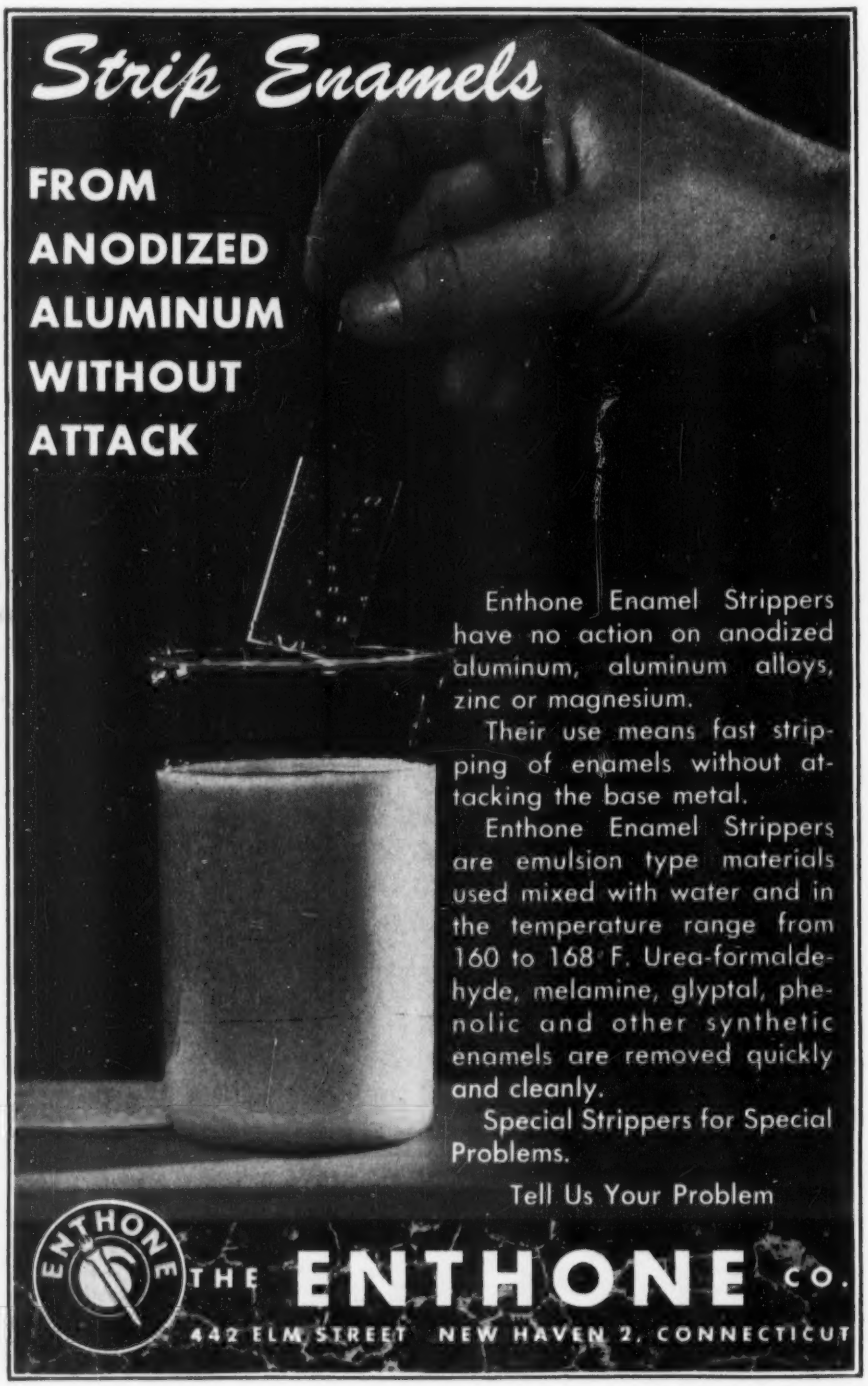
Similarly, it is possible, by using bronze or aluminum paint on radiators in rooms which are overheated and colored or white paints in rooms not sufficiently heated, to improve conditions without going to the expense of installing new radiators of larger or smaller sizes.

Application 2. In installing radiators in a new house, somewhat smaller radiators may be installed if they are to be painted with colored paints rather than with bronze or aluminum paints.

Application 3. If the radiators on a hot water system are painted with metallic paint and are all too small so that the water must be kept hotter than is desired in order to heat the house, they may be repainted with non-metallic paint and it should then be possible to heat the house with the water in the system not quite so hot. There will be no noticeable saving of fuel.

Application 4. Since basements are usually over-heated and much of the heat supplied there is wasted, some

(Concluded on page 757)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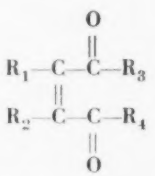
Patent Abstracts

Enamel Coating

U. S. Pat. 2,324,739. W. N. Stoops and W. A. Denison, assignors to Carbide and Carbon Chemicals Corp., July 20, 1943. A coated metallic article in which the coating comprises an acid-reacting vinyl resin heat-treated in place with a higher polyalkylene glycol to produce a hard, flexible, tough and adherent coating, the hydroxyl groups in said polyalkylene glycol being separated by at least three alkylene radicals joined by oxygen atoms, and said acid-reacting vinyl resin being a conjoint polymer of a vinyl compound of the structure $R.CH=CH_2$, where R is a radical of the group consisting of halogen, organic radicals having at least one benzene ring, and aliphatic acyloxy radicals, with an unsaturated carboxyl compound of the structure,



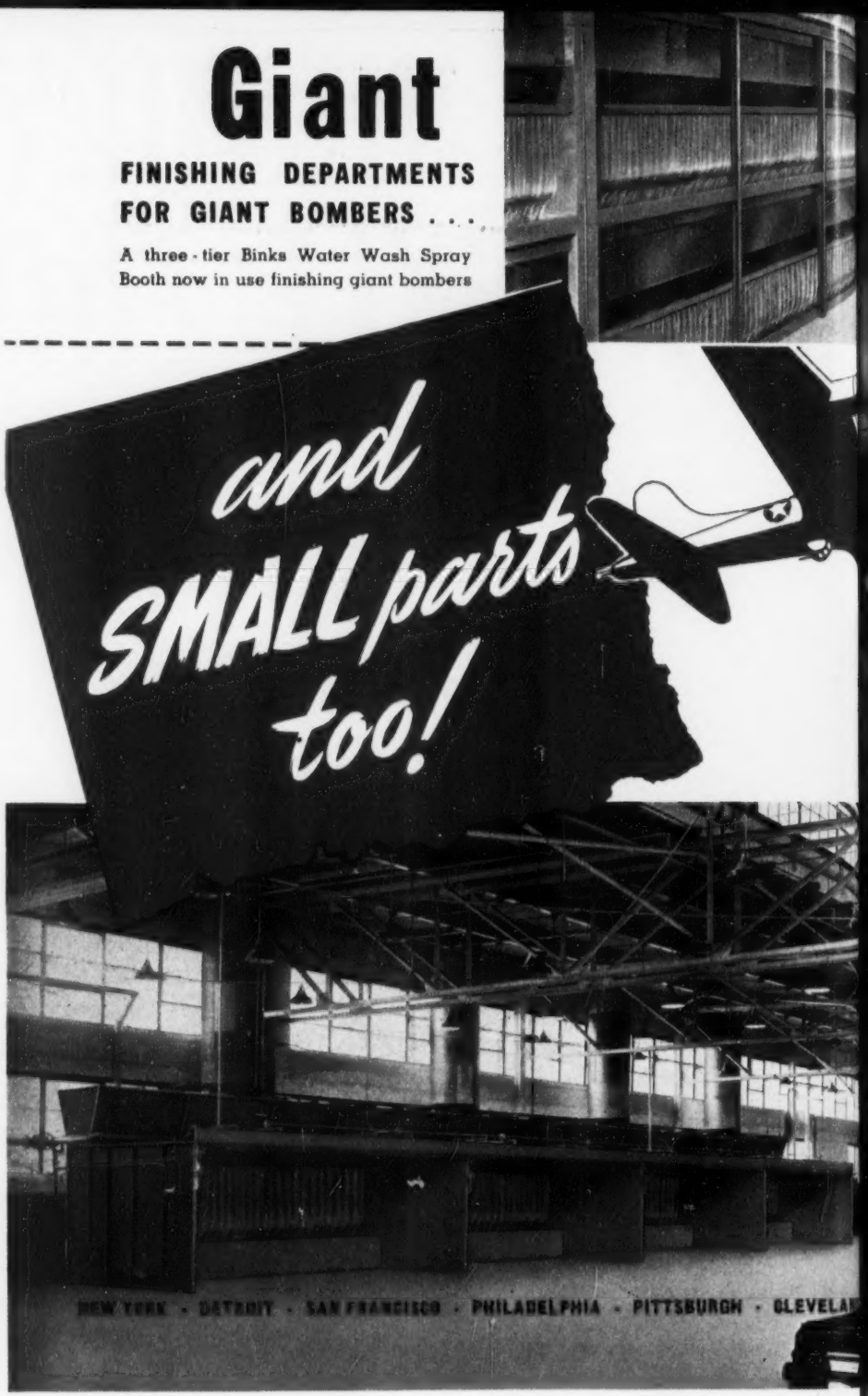
where R_1 and R_2 are radicals of the group consisting of hydrogen, lower alkyl, aryl and aralkyl, and R_3 and R_4 are radicals of the group consisting collectively of oxygen and individually of hydroxyl and lower oxyalkyl, R_3 being hydroxyl when R_4 is a lower oxyalkyl group.

Coating Composition

U. S. Pat. 2,325,987. R. C. Swain and P. Adams, assignors to American Cyanamid Co., August 3, 1943. A coating composition containing substantial amounts of polystyrene and a melamine-formaldehyde resin which has been reacted with a monohydric alcohol containing between 6 and 8 carbon atoms, wherein the molal ratio of formaldehyde to melamine is at least about 4:1 and wherein the weight ratio of polystyrene to melamine resin is at least about 3:2.

Coating Composition

U. S. Pat. 2,325,986. R. C. Swain and P. Adams, assignors to American Cyanamid Co., August 3, 1943. A coating composition containing substantial amounts of cyclized rubber obtained by reacting the rubber with amphoteric metal halides and a melamine-formaldehyde resin which has been alkylated with an acyclic alcohol containing 3 to 8 carbon atoms, wherein the molal ratio of formaldehyde to melamine is between about 4:1 and about 6:1 and wherein the weight ratio of the cyclized rubber obtained by reacting the rubber with amphoteric metal halides to melamine resin is at least about 3:2.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Paint Roller

U. S. Pat. 2,325,867. M. Matsakas, August 3, 1943. A painting device comprising a roller including inner and outer cylinders, heads fixed to and closing the ends of the outer cylinder, a shaft rotatably supporting the roller through said heads and having a handle, the inner cylinder being shorter than and movable in the outer cylinder, said cylinders having perforations adapted to be moved into and out of registration and a tubular foraminous cloth covering on the roller.

Stable Coating Composition

U. S. Pat. 2,324,740. W. N. Stoops and W. A. Denison, assignors to Carbide and Carbon Chemicals Corp., July 20, 1943. A liquid coating composition stabilized against gelation on storage comprising a dispersion in aqueous ammonia of a conjoint polymer of a vinyl compound of the group consisting of styrene, vinyl acetate, and vinyl chloride with a compound of the group consisting of maleic acid and maleic anhydride, and a higher polyalkylene glycol in which the hydroxyl groups are separated by at least three alkylene radicals joined by oxygen atoms.

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Metallic Finish

U. S. Pat. 2,326,001. G. Ariotti and E. H. Bucy, assignors to Atlas Powder Co., August 3, 1943. The process for producing a simulated hammered metal finish upon a surface, which comprises applying to the surface a uniform unspattered coating of a composition containing a finely divided metal powder and a soluble base selected from the group consisting of varnish bases and lacquer bases, said composition having a normal solids content for a coating composition and being capable of drying to form a protective and ornamental coating, allowing said coating to dry only partially, and then spattering the partially dried coating with a liquid of not over 40 centipoises viscosity consisting essentially of volatile solvent for the said soluble base to cause drops of said liquid to impinge upon the partially dried coating at separated points to redissolve the said soluble base only at such points and permit the metal powder at the point of impingement to flow and assume the crater-like appearance of hammered metal, and thereafter drying the coating completely.

Coating Composition

U. S. Pat. 2,326,698. R. C. Swain and P. Adams, assignors to American Cyanamid Co., August 10, 1943. A coating composition containing polyvinyl acetate methylal and a melamine-formaldehyde resin which has been heated until reacted with an alcohol selected from the group consisting of butyl alcohols and benzyl alcohol, wherein the molal ratio of formaldehyde to melamine is at least about 4:1 and wherein the weight ratio of polyvinyl acetate methylal to melamine resin is at least about 3:2.

Coating Composition

U. S. Pat. 2,326,699. R. C. Swain and P. Adams, assignors to American Cyanamid Co., August 10, 1943. A coating composition containing polyisobutylene and a melamine-formaldehyde resin which has been heated until reacted with a butyl alcohol wherein the molal ratio of formaldehyde to melamine is at least about 4:1 wherein the weight ratio of polyisobutylene to melamine resin is at least 3:2.

Coating Composition

U. S. Pat. 2,326,623. E. W. Crosby, assignor to E. I. duPont de Nemours & Co., August 10, 1943. A coating composition adapted to be applied by spraying having approximately the following composition:

	Parts
Ultramarine blue pigment	4.1
Lithol red pigment	.4
Bone black pigment	.1
Aluminum flake pigment paste	2.9
Alkyd resin A (solids)	3.0
Alkyd resin B (solids)	30.3
Urea-formaldehyde-monohydric alcohol resin (solids)	.9
Driers	.2
Hydrocarbon solvents	57.1
Raw rubber	1.0
	100.0

Burning and Scraping Tool

U. S. Pat. 2,326,630. J. S. Fagan, Aug. 10, 1943. In a paint burning and scraping tool, a hollow cylindrical member provided with a rear wall, a blade formed integral with and projecting forwardly and downwardly from the forward lower portion of said hollow member, there being a single oval shaped jet opening formed in the forward end of said hollow member, the major axis of which oval-shaped opening is horizontally disposed and the bottom of said opening coinciding with the upper surface of the rear portion of the blade so as to direct the single wide jet of burning gaseous fuel that passes through said opening forwardly to strike the surface that is being acted upon, forwardly from the front edge of the blade, a gaseous fuel supply pipe connected to the central portion of the wall closing the rear end of said hollow cylindrical member, and there being a plurality of air inlet apertures formed in said rear wall around the gaseous fuel supply tube connected thereto.

Cleaning Steel for Finishing

By ALFRED DOUTY, Chief Chemist,
and EUGENE SNYDER, Chemist

American Chemical Paint Co., Ambler, Pa.

CONTACT with manufacturers producing war materials has disclosed widespread misunderstanding of, or indifference to, certain fundamental principles involved in the proper preparation of steel for finishing. The principles are not new. They are well known to experienced finishers and have become more and more firmly established with the development of improved finishing materials and methods.

It is the purpose of this article to point out some of these principles and to focus attention on certain improper practices and procedures which are being followed in some instances in the metal field, particularly by organizations to which metal surface preparation is a new problem.

Visible and Invisible Contaminants on Steel Surfaces

Many government specifications include clauses reading, in effect, "All rust, scale, oil, grease and dirt must be removed from the (steel) surface before application of the paint (varnish, lacquer, japan, etc.)." Sometimes methods are specified for carrying out this cleaning operation. More frequently they are not.

The specifications quoted are quite proper but not sufficiently explicit and are usually interpreted to be directed at the removal only of the visible impurities enumerated. Few inspectors realize that a surface treated so as to carry out the quoted injunction of the specification may not be sufficiently clean to paint.

It is unsafe to judge the condition of the cleaned surface by its apparent "cleanness", which often has been the criterion by which contractors and inspectors have judged the merits of a cleaning procedure. Many materials will give metals a clean and uniform-looking surface and yet will leave them highly unsafe to paint. Addition to the rinse water of alkaline materials will generally do this. Among the alkaline materials that are added to rinse baths are caustic soda, soda ash, sodium chromate, mixtures of sodium chromate and sodium bicarbonate, etc. In fact, if the last cleaning step has been in an alkaline solution, the use of a rinse water which is not changed rapidly and accumulates alkali, will produce this effect. *It cannot be too strongly emphasized that such additions are ruinous to organic coating life.* Work which is too even looking, free of any kind of discoloration, and which remains silvery white on standing while still damp is open to suspicion.

In a word, it is unsafe to judge the suitability of a surface to receive and hold an organic finish from the *appearance* of the surface since there are invisible impurities which are quite as harmful to paint life as the visible ones mentioned in the quoted specifications. These are the soluble materials which include: (a) Alkalis and alkaline salts; (b) alkaline earth metal salts, such as are always present in water; (c) soluble salts of iron, such as the chlorides and sulfates which remain as residues from pickling operations; (d) other soluble materials, such as soap, sulfated or sulfonated wetting or emulsifying agents, etc.

Immediately and Latently Harmful Contaminants

Contaminating materials may, in general, be classified as follows:

A. *Immediately Harmful Materials.* These are essentially the same as the visible contaminants mentioned above. They include rust, heat scale of one form or another, grease, oil, solid "dirt" such as filings, ordinary dust, etc. Such contaminants, if not removed, generally produce immediate effects upon the appearance or adhesion of the applied organic coating. Occasionally, however, some of their effects are delayed. Mill scale, for instance, may give no immediate trouble. Later, however, under conditions of vibration or shock it may become loosened, leaving the organic coating with no secure anchorage. Rust may contain absorbed soluble material which exhibits its untoward effects only at a later date. However, these materials are so universally recognized as being undesirable that their removal is usually stressed by all concerned with a finishing operation.

B. *Latently Harmful Materials.* These include, in general, the soluble contaminants mentioned above. They may not produce visible effects on applied organic coatings immediately. These materials, depending on the amounts present and the type of organic coating, may cause serious loss in resistance of the finish to corrosive conditions. Their effects are readily made apparent by exposing the articles to the salt spray or to high humidity. Early failure from a scratch and blistering under the finish soon demonstrate the presence of latently harmful contaminants.

Removal of Contaminants

Many methods for removing visible contaminants leave behind invisible, latently harmful contaminants. This fact is not too well appreciated. Let us examine some methods commonly used for cleaning steel, noting carefully the kind of dangerous latently harmful impurities which each may leave behind.

A. *Mechanical Methods*: These include sandblasting, shot-blasting, abrasive paper or steel wool cleaning and other "mechanical" methods. They may leave behind traces of any contaminant originally on the work. Only the surface is cleaned. Pits and anything contained in them are not touched. Furthermore, reuse of shot, sand or abrasive paper leads to progressively worse contamination.

B. *Vapor Degreasing*: This process almost invariably leaves a film of iron chloride on the work and

therefore, leaves it extremely susceptible to rusting.

C. *Hydrochloric or Sulfuric Acid Pickling*: These processes leave the work extremely susceptible to corrosion. Even after thorough rinsing, there is likelihood that traces of basic salts of iron remain to stimulate corrosion under the paint film. The rinse water remaining leaves its quota of salts on the surface as it dries up. In addition, it is practically impossible to dry pickled and rinsed work without the development of a severe rust "blush", unless the work has been rinsed in water containing an alkali. In this case, the same difficulties will arise as in the case of alkali-cleaned work.

D. *Alkaline Cleaning*: Cleaning in alkali solutions, with or without soap, and with or without the use of the electric current, results in traces of alkali which are extremely difficult, if not impossible, to rinse from steel surfaces. Traces of alkali are extremely deleterious to paint life. Again, the film of adhering rinse water as it dries, leaves behind, the accumulated alkalis dragged into the rinse tank from the cleaning operation in addition to the usual amounts of dissolved salts contained in all natural waters.

E. *Cleaning in Phosphoric Acid Type Cleaners*: This type of cleaning is highly desirable. Cleaners of this type are available for application by brushing, spraying or dipping. They contain, in general, phosphoric acid, grease solvents, wetting agents, emulsifying agents, and sometimes inhibitors of acid attack on steel. They are formulated for use hot or cold, of various acid strengths and with various amounts of grease removing agents so that they may be used for the removal of all but the heaviest rust and scale and also for the removal of all but the heaviest grease.

Use of the correct type of phosphoric acid type cleaner (whether or not preceded by a preliminary cleaning in alkali or by pickling in sulfuric or hydrochloric acid) affords a method for the removal of visible impurities which leaves the least amount of invisible, latently harmful residues.

Traces of phosphoric acid left behind are not only harmless but actually beneficial to paint life. Of all chemical cleaners, the phosphoric acid type cleaners are the safest and are the least critical with respect to the final rinse solution. The only deleterious materials which can be left behind are traces of material brought into the solution. Because of these possible "dragged-in" materials, the importance of the final rinsing operation cannot be minimized.

Importance of the Final Rinse

No matter what general method of cleaning is employed, the removal of the cleaning agent itself, together with the contaminants picked up from the metal, is a very critical step in the cleaning operation. Water soluble salts, bases and objectionable acids, constitute the most usual and serious of the invisible, latently harmful surface contaminants spoken of previously. Almost all cleaning chemicals contain such substances, which are absorbed more or less strongly by the steel surface and are rinsed off with difficulty. It is, moreover, very difficult to keep rinse water free of them. In addition, all natural waters contain dissolved salts to a greater or lesser degree.

Obviously, whatever remains on the surface after the rinsing, and whatever is dissolved or suspended in the rinse water film adhering to the surface, still remains when the surface is dried. Traces of alkaline, saline, or water soluble material in general, even such amounts as may be present in most tap water, are very harmful to paint films if left on steel surfaces. It is, therefore, an axiom that simple tap water rinses, no matter how often repeated, never leave a steel surface in proper condition for painting.

A Good Cleaning Cycle

A good cleaning cycle, then, consists of the following operations:

1. Cleaning proper, for the removal of gross visible contaminations. This is best accomplished with a properly constituted phosphoric acid type cleaner. In cases where extremely heavy rust, grease, or heat scale are present, this operation may need to be preceded by the following steps: (a) Removal of heavy grease, drawing compound, etc., followed by (b) pickling to remove heavy rust, mill scale, etc. A water rinse should be interposed between (a) and (b) to prevent, for instance, dragging alkali cleaner into an acid solution.

2. One or more rinses of clean water to remove large amounts of still loosely adhering dirt, etc., and especially to remove the greater part of the soluble chemicals used in the first operation.

3. A final "neutralizing" rinse, preferably hot, to assist subsequent drying of the work, and containing substances which will, irrespective of the previous treatment: (a) neutralize the effect of any alkali or alkaline salt in the rinse water or remaining on the surfaces of the work; (b) leave on the surface no corrosion stimulative material, or at least render inactive traces of any such material which remain; (c) give the surface a uniform, pleasing appearance. (This requirement is important mostly from a psychological standpoint. Only in the case where the final finish coat is transparent is unevenness of surface color visible in the finished article.)

Proper Rinsing Conditions

Assuming that suitable cleaning methods have been found for removing gross visible impurities and also as much as possible of the invisible soluble matter from the work, a final rinse solution to be satisfactory must:

(1) Contain either phosphoric or chromic acid or both in very dilute solution — about 0.01-0.10%.

(2) Be on the acid side of neutrality, preferably having a pH value between 3 and 5.

(3) Contain suitable agents to cause the rinse water to drain off in an even film without leaving droplets to dry irregularly on the surface.

In addition, the final rinse solution:

(4) Must be carefully controlled so that it does not accumulate more than certain very small amounts of soluble salts. Chlorides and sulfates are especially harmful, but the content of the rinse water in soluble salts of any description must be kept within definite bounds. Simple methods for such control are available.

In addition, to avoid oxidation or staining of the surface after rinsing:

(5) The final rinse solution should be very hot, preferably boiling, and the articles should be left in the solution long enough to attain its temperature.

(6) The work should be so arranged and, if necessary, tilted to allow thorough and complete drainage.

(7) The work, if it does not dry immediately after removal from the boiling rinse, should be dried in an oven or in a stream of hot air to assure rapid and complete drying.

Practical Benefits of Properly Constituted Final Rinses

Practical experience has proved that *acid* rinse waters are essential to good paint life. Many years of experimentation have failed to disclose any suitable material with which to acidify the rinse waters with the exception of properly formulated materials containing phosphoric acid or chromic acid or both.

The properties of phosphoric and chromic acid treated rinse waters may be compared as follows:

(1) Very dilute, hot phosphoric acid-base rinse water allowed to dry on steel: (a) does not coat the work and reacts with the steel and air to produce a harmless, insoluble iron phosphate residue; (b) leaves the surface relatively free of volatilizable impurities such as traces of chlorides; (c) reacts with calcium and magnesium salts in the rinse water in the presence of the steel and air to form insoluble phosphates; (d) usually causes the metal to discolor slightly while it is still wet, giving a slight white-to-yellow matte film. This indicates the completion of the oxidation cycle of the steel under these conditions. This beneficial phosphate-oxide film constitutes the "ashes" of a completed active cycle of the metal. It is now inert and in excellent condition to receive organic films.

(2) Very dilute, hot chromic acid-base rinse water allowed to dry on steel: (a) does not react with the steel, except to "passivate" it. Many persons attribute this "passivation" to a superficial oxide film which tends to be self-healing in the presence of adsorbed chromic acid; (b) renders traces of chlorides harmless. This may be due to their volatilization or to the effect of adsorbed chromic acid in preventing the usual effect of chlorides in stimulating a rusting cycle; (c) leaves the steel "passive". The metal will, therefore, not discolor while it is still wet; (d) often leaves on the steel a slight yellow stain of chromic acid, usually more apparent at drainage points, in no wise harmful to organic finishes.

Phosphoric or chromic acid types of rinse water additions, both of which contain other ingredients necessary to proper draining and drying of the work, can be selected to provide a suitable surface upon which the paint finish can be applied.

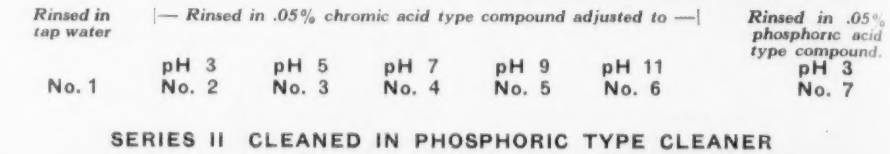
EFFECT OF VARIOUS RINSING CONDITIONS

LOW BAKED UREA-FORMALDEHYDE RESIN ENAMEL
40 HOURS SALT SPRAY EXPOSURE

SERIES I ALKALI CLEANED

Rinsed in tap water	*— Rinsed in .05% chromic acid type compound adjusted to —*					*Rinsed in .05% phosphoric acid type compound.*
	pH 3	pH 5	pH 7	pH 9	pH 11	pH 3
No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7

SERIES II CLEANED IN PHOSPHORIC TYPE CLEANER



Rinsed in tap water	*— Rinsed in .05% chromic acid type compound adjusted to —*					*Rinsed in .05% phosphoric acid type compound.*
	pH 3	pH 5	pH 7	pH 9	pH 11	pH 3
No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7

Summary

The following conclusions are based on the results of long, practical experience supplemented by repeated laboratory tests.

The effect of certain variations in rinsing procedure is illustrated in the accompanying photograph of two series of panels which have been exposed to salt spray. The panels of Series I were alkali cleaned in a conventional caustic soda-sodium silicate alkali, thoroughly rinsed in running tap water and immediately treated for two minutes in chromic acid type baths with pH adjusted to the values shown and heated to 190-220° F. The panels were dried in an oven and then given one coat of a white quick-baking urea-formaldehyde enamel. The effect of and harm from increasing the pH of the rinse bath and of rinsing in untreated tap water is clearly illustrated.

After baking and aging for 24 hours, one set of panels was exposed in a salt spray cabinet, another set in a humidity cabinet operating at 100° F. and 100% relative humidity.

The panels exposed in the humidity cabinet are not reproduced here since the blistering observable is difficult to photograph. However, it may be stated that the results obtained were closely parallel to those obtained by exposure to salt spray. Panels which exhibited greater failure in the salt spray cabinet exhibited more blistering in the humidity cabinet.

Series II includes panels which were cleaned by immersion in a bath of a phosphoric acid type cleaner instead of the alkali cleaner used in the case of the panels of Series I. Otherwise, the treatments of the panels of Series I were duplicated. It is to be noted that these panels are reproduced here merely as typical examples of the type of results obtained in the laboratory and the conclusions reached are based on practical commercial experience plus a great number of other tests.

Conclusions

1. Regardless of the type of cleaning used, the nature of the final rinsing solution has a profound effect on the corrosion resistance of a finish.

2. Cleaning in a properly formulated phosphoric acid type cleaner is superior to other types of cleaning such as alkali cleaning because traces of phosphoric acid left on the steel are beneficial rather than harmful.

3. While rinsing in tap water is less harmful on surfaces cleaned with properly formulated phosphoric acid type cleaners than on alkali cleaned surfaces (as will be observed by comparing Panels No. 1 in Series I and II), rinsing in untreated tap water is never safe because all natural waters contain dissolved salts, because it is difficult to keep rinse water free of rinsed-off salts and because it is almost impossible to remove traces of deleterious residues by mere rinsing.

4. The final rinse should contain the proper amounts of phosphoric or chromic acid and such addition agents as are required. Compare Panels 1, 2, 3 and 7, Series I, and Panels 1, 2, 3 and 7, Series II (Optimum phosphoric acid or chromic acid concentrations are between 0.01 and 0.1%.)

5. The final rinse must be on the acid side of neutrality. The optimum pH range for maximum film durability is from 3 to 5. Film durability falls sharply as the pH of the final rinse rises through pH 7. Compare Panels 2, 3, 4, 5 and 6, Series I and Panels 2, 3, 4, 5 and 6, Series II. Note that panels rinsed with a pH of 3 or 5 are good while those rinsed with a pH of 7 and above are bad. Also, the results on phosphoric acid based cleaned surfaces are better than those on alkali cleaned surfaces.

6. Even when the final rinse solution is constituted as per Numbers 4 and 5 above, it must *not* contain more than traces of dissolved salts. Even alkali phosphates and chromates are harmful. The maximum salt concentration should not exceed 0.01-0.05%, depending on the kind of soluble salts present. Chlorides and sulfates are harmful.

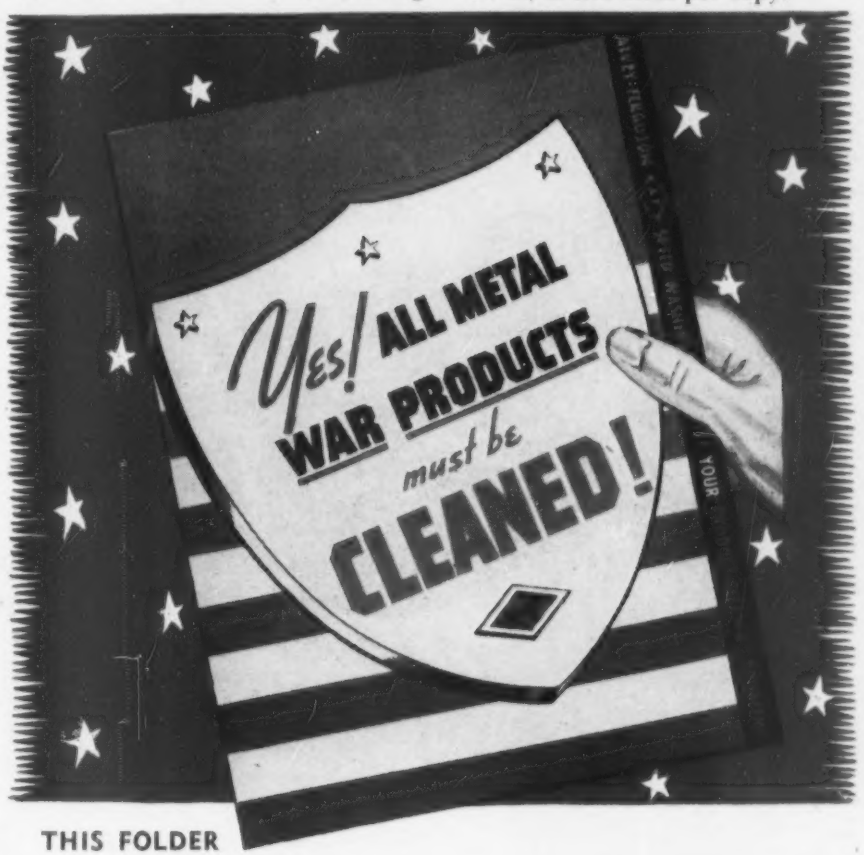
7. The effectiveness of chromic or phosphoric acid in overcoming difficulties due to adsorbed soluble impurities on steel surfaces is improved when they are used in the form of properly formulated preparations.

(Concluded from page 750)

economy can be effected by painting the heater and pipes with metallic paint. This can not, however, serve as anything more than a poor substitute for a covering of good insulating material about an inch thick, which is capable of making an appreciable saving in the coal bill. The insulating material will remain effective for years while the paint becomes ineffective if covered with dust.

Application 5. If a radiator is situated next to an outside wall, as most of them are, it is evident that the heat supplied directly to this wall is more or less wasted. Some slight economy may be obtained, therefore, by using metallic paint on the side facing the wall and non-metallic paint on the visible portions. The gain is not large enough to be important but, on the other hand, in putting non-metallic paint over metallic it is not worth while to go to the trouble of repainting the side next the wall.

Results of emissive tests of paints for decreasing or increasing heat radiation from surfaces and a discussion of various applications of the results found are given in National Bureau of Standards Technologic Paper No. 254, which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at five cents per copy.



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METAL PRODUCTS CLEANING & FINISHING EQUIPMENT

Business Items

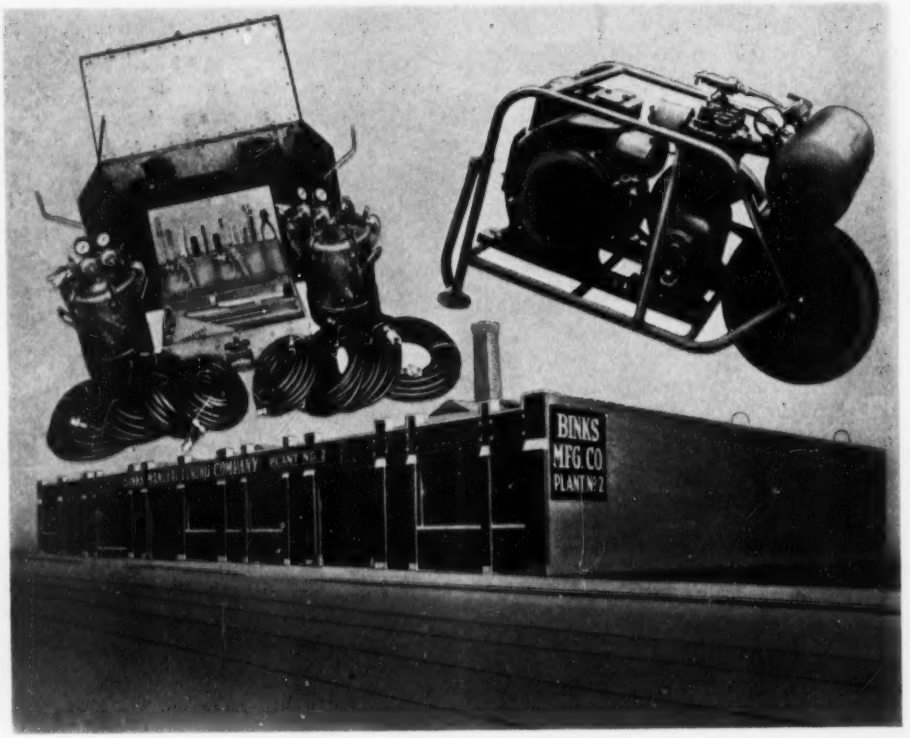
Binks Devotes Entire Output of Plant No. 2 to U. S. Engineers' Contracts

The photograph at the right illustrates *Binks Manufacturing Company's* Plant No. 2, at 3255 West Lake St., Chicago, Ill., where the entire 18,000 sq. ft. is devoted to the assembly, processing, export boxing and shipping of paint spray outfits on U. S. Engineers' contracts.

Illustrated above the plant is the compact chest outfit, containing two 5-gallon pressure material tanks, two spray guns, hose and all accessories for a two-man spray outfit, all completely packed in a sturdy chest according to U. S. Engineers' specifications.

Also illustrated above the plant is the wheelbarrow type compressor outfit, weighing less than 225 lb. net, which is used to power the spray equipment, and is of sufficient capacity to operate the two-man outfit.

These outfits are being shipped to U. S. Army Engineer depots throughout the world for use in camouflage work, and for general maintenance painting.



The contracts with the U. S. Engineers on these outfits are of sufficient size to warrant the entire attention and space of Plant No. 2, and thus segregate this plant's operation from all the regular work of the Binks' main plant at 3114 Carroll Ave.

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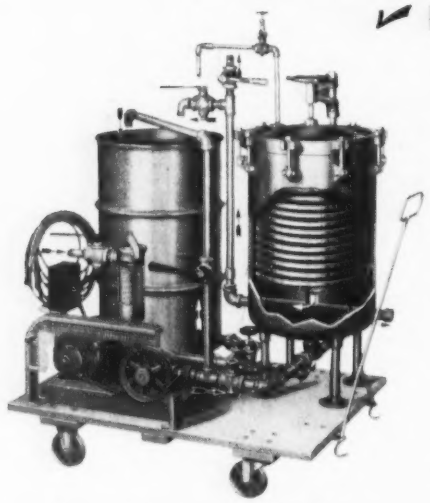

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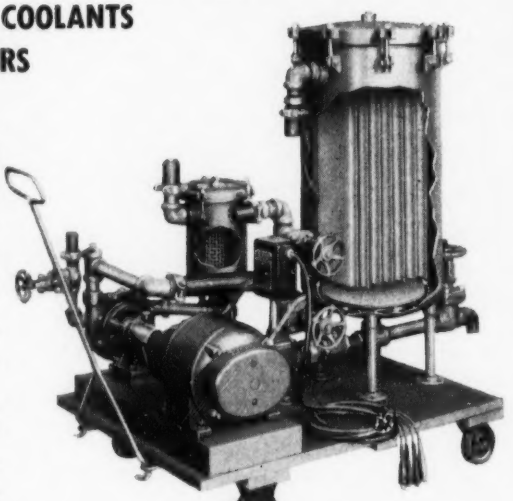

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Appointment of *George M. Muschamp* and *Paul L. Goldstrohm* as vice-presidents of the *Brown Instrument Co.*, a subsidiary of *Minneapolis-Honeywell Regulator Co.*, has been announced.

Muschamp will be vice-president in charge of engineering and Goldstrohm will be vice-president in charge of production. Both posts are newly created.

Muschamp, who is 34 years old, has been with the Brown engineering department for 12 years and has been in charge of engineering for the past three years. He directed the development of a number of Brown electronic devices, including the electronic potentiometer for controlling industrial temperatures and the Flight Recorder, which is being widely used in testing war planes.

Goldstrohm, who is 41, recently celebrated his 20th year with the company. He has been serving for the past two years as assistant general manger and formerly was the company's purchasing agent.

Miller G. Robinson

Miller G. Robinson has been appointed manager of engineering service of the Paint Division of *Aluminum Industries, Inc.*, Cincinnati, O., according to an announcement by *M. M. Carmody*, sales manager.

A veteran of the industry, Mr. Robinson brings with him to his new position a background of 34 years of experience in paint engineering, service and sales work. With Coppes, Inc., of Nappanee, Ind., he was production manager of the finishing room. Later he served as sales and service engineer for the O'Neil Duro Co., of Milwaukee, Wis., manufacturer of industrial finishes. For several years prior to joining Aluminum Industries, Mr. Robinson was affiliated with the Thresher Varnish Co., of Dayton, O., Division of Pittsburgh Plate Glass Co., in a sales engineering capacity.

With Aluminum Industries, Mr. Robinson will be in charge of all paint engineering service for the company.

Effective September 1, 1943, *Ault & Wiborg Corp.*, a subsidiary of *Interchemical Corp.*, became the *Ault & Wiborg Division* of *Interchemical Corp.*

The business will be carried on without change in management or other personnel.

Hercules Powder Co. has announced the appointment of *G. Fred Hogg* as sales director of its naval stores department.

Mr. Hogg, who formerly was manager of the naval stores department office in Chicago, has spent the past year at the company's industrial explosives plant in Hercules, Calif., where he served as technical assistant superintendent and chairman of the plant's War Manpower Committee.

The new sales director joined the company in 1929 as a chemist at the Kenvil, N. J. laboratory, after having received his M.S. in chemical engineering from the University of Michigan.

In 1930, he joined the naval stores department as a sales and service representative. In 1935, he was transferred to the Chicago naval stores office, and was appointed manager in February, 1936.

Louis L. Shapiro has been appointed plant manager of the *Glyco Products Co., Inc.*, Brooklyn, New York.

Mr. Shapiro was graduated from Franklin and Marshall College with the degree of B.S. in chemistry and later received his degree in chemical engineering from Drexel Polytechnic Institute.

For the past fourteen years he has served as chief chemist, director of the chemical and research departments and assistant superintendent with the Wilson-Martin Division of Wilson and Co., Inc.

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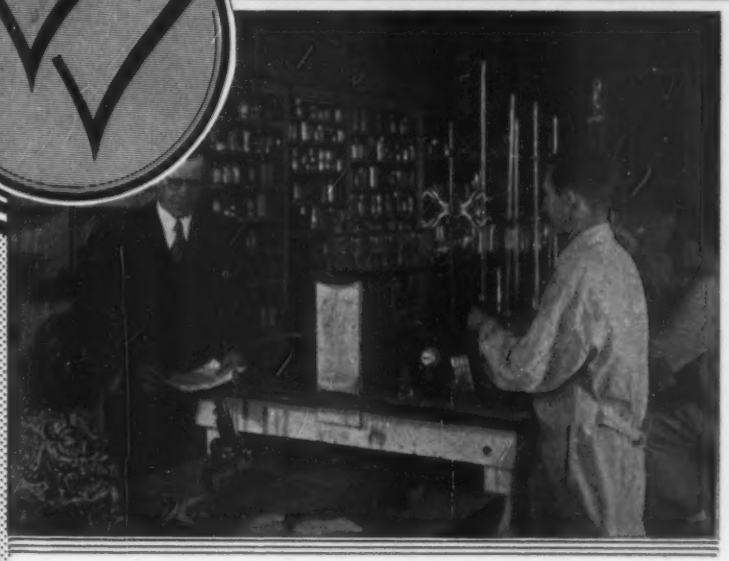

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A Chemical Dip Treatment for Iron, Steel, Zinc and Cadmium . . . providing a Rust Inhibiting Base for Paints, or a Final Finish.

The IRCO-IZING PROCESS is easy to set-up. Only two steel tanks required, one for emersion in the IRCO-IZING solution, another to rinse it off. The IRCO-IZING PROCESS fully meets government rustproof specifications and its use will eliminate many of your production bottlenecks.

In order for you to become entirely familiar with IRCO-IZING PROCESS, we will be very glad to treat samples of your production, without obligation, in our laboratory, and return them to you for examination and test.

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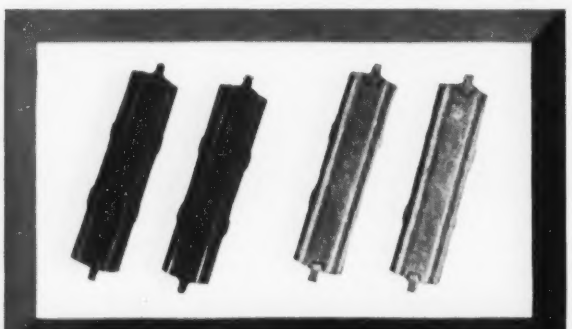
● The makers of Johnson's Wax have developed special Corrosion Inhibiting Waxes for the protection of a great variety of metal products for war use.

Many metal parts like the Springfield rifle clips shown in the illustration are Parkerized. The pair at the left have been



coated with Johnson's Black Corrosion Inhibiting Wax. Such coatings have been proved most acceptable as a final finish for Parkerized surfaces. They are dry lubricants and therefore are not readily removed by handling or by contact with containers. Hence more permanent protection against corrosion is insured by their use. Johnson's Corrosion Inhibiting Waxes provide the type of dry lubrication so desirable for many ordnance parts. For many uses these shop coatings meet rigid Government specifications.

May we help you?

Johnson's Corrosion Inhibiting Waxes might well be useful in your plant. They have a further definite advantage over ordinary shop coatings in that they are non-flammable. They are also non-toxic. Fast drying, they have high coverage and are easily applied by dip or spray methods. No special equipment required. No dilution or heating necessary. Write for free test sample and complete information.

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Industrial Wax Division, Dept. MF-93, Racine, Wisconsin
Canadian address: Brantford, Ontario

Buy More U. S. War Savings Stamps and Bonds

JOHNSON'S
Corrosion Inhibiting
★ WAXES ★

Glycerine Research

Due to the enormous demand for alkyd resin paints by the Army and Navy, the Glycerine Producers Association has placed resins first on its research program. Looking forward to post-war demands, however, the association sees important prospects for glycerine in the food industry.

Glycerine and phthalic anhydride, according to the association's research committee, are essential ingredients for the alkyd resin paints which are used universally to protect our ships, tanks, planes, jeeps, trucks and other military equipment against weather, salt water, driving sand, rust and hard wear. Estimates received by the committee show that 42 percent of the 1943 glycerine production available after fulfilling lend-lease requirements will go into these extra-tough coatings.

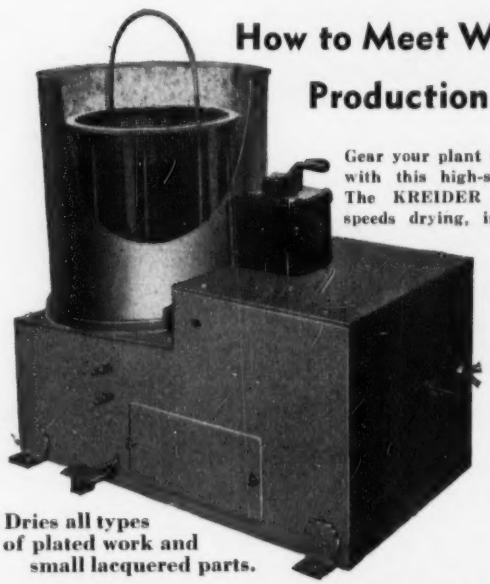
Next to resins as the objective of glycerine allocations this year come explosives. It is expected that 23 percent of the 1943 absolute glycerine production, now estimated at about 150,000,000 pounds, will be for this war purpose.

Resins comprised one of the first subjects investigated when the association's research work began 17 years ago. Lately, when it became evident that glycerine was an essential war product, the association placed its laboratory facilities at the disposal of the WPB and the Food Distribution Administration.

Research has collaborated with various federal and state departments and with private individuals in the development of an economical quick freezing process using a 50 percent glycerine solution. It was found that by immersion in this liquid, food products could be frozen quicker and better and at higher temperatures than those required for air freezing. Another recent discovery relates to the value of glycerine in making chocolate bars resist hot weather and in preserving peanut butter.

Although the search for new sources of glycerine has gone on for several years, the committee reports that, up to the present, none has been found comparable to animal and vegetable fats and oils. Experiments in the recovery of glycerine from distillers' waste have shown laboratory possibilities which, however, have not been turned to practical use, owing to the difficulty of getting the special machinery required, and to the doubt of a commercial postwar market for glycerine from fermentation sources.

How to Meet Wartime Production Demands



Gear your plant to faster production with this high-speed drying outfit. The KREIDER Centrifugal Dryer speeds drying, improves quality of plated work, cuts drying cost. It is easily operated by one worker. Equipped with V-belt drive, anti-friction bearings, ¾ H. P. motor, foot brake and reversing drum switch. All steel, electric welded construction. Auxiliary heating unit available.

Dries all types of plated work and small lacquered parts.

Write or wire for complete information and prices.

DELLINGER MFG. CO. 727 N. Prince St., Lancaster, Pa.

KREIDER
Centrifugal Dryer

New Equipment

Gloss Standards

Calibrated low-gloss standards for use in testing the compliance of camouflage materials with specifications requiring them to have low gloss may be obtained from the National Bureau of Standards, Washington, D. C. The standards are calibrated according to Procedure A of A.S.T.M. Tentative Method D523-41T for the specular gloss of paint standards.

Information on these standards, price, etc., may be obtained by writing to the Bureau.

New Paint Stick Marker for Cold Surfaces

A new paint stick marker for use on all cold surfaces is announced by the Markal Co., Dept. OF, 6 East Lake St., Chicago, Ill.

According to the manufacturer, this marker, designated as Markal "N", makes a wider, more highly legible mark than other Markal paint sticks and was developed especially for use in shipyards, steel mills, railroad shops, foundries, etc., but has a wide applicability elsewhere. The new stick is paint in stick form and is said to produce permanent, fade-proof, weather-proof markings on metal, lumber, rubber, stone, marble, hard polished plate glass, porcelain, vitrolite, plastics, cellophane and other surfaces. It is fast drying.

The stick is claimed to be particularly suitable for layout purposes on steel plates, either bare or coated with zinc chromate or other protective coatings. The marks are said to dry sufficiently soon after application so that marked plates or surfaces may be handled without smearing and to dry thoroughly in ten minutes after which surfaces may be walked on without effacing the markings.

The stick is made in red, white, blue, green, yellow and black. Each color may be used for easy identification purposes as well as for piece work marking.

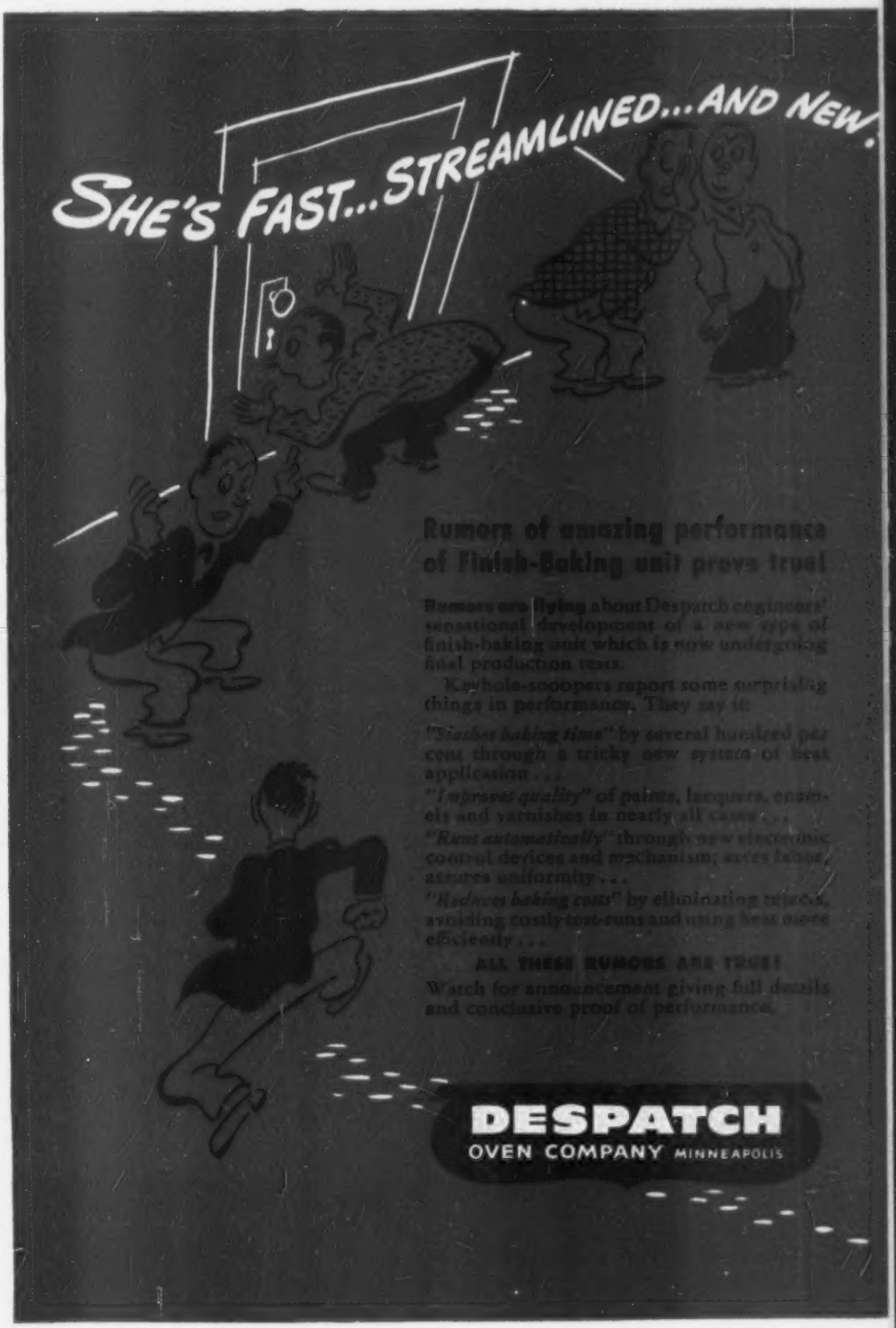
Literature and free samples on Markal "N" and other paint sticks for hot and cold surfaces may be obtained by addressing the manufacturer.

Chrome Plate Cleaner

Midwest Manufacturing Co., Dept. OF, 32-38 Davenport Ave., Detroit, Mich., is the manufacturer of Met-L-Krome, a solvent-type cleaner for chrome plated surfaces. This material, which may be applied with a cloth, is said to contain no abrasives and to soften and loosen rust and grime without scratching or otherwise injuring the chrome plate. Following cleaning with Met-L-Krome, the manufacturer recommends application of Krome-Seal, a protective coating said to resist climatic and weather conditions and prevent the formation of new rust.

Centrifugal Dryer

The Kreider centrifugal dryer, for drying and lacquering all types of small parts, may be obtained from Dellinger Manufacturing Co., Dept. OF, 725 N. Prince St., Lancaster, Pa. This dryer, which can be supplied with an auxiliary heating unit, is equipped with a 3/4 h. p. motor which drives the basket at 625 r.p.m. by means of V-belts. The basket is 12" in diameter and 12" deep. Maximum floor space required by the standard model is 18" by 32". Floor space with the heating unit is 19½" by 44½". The dryer can also be supplied to operate from a line shaft.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Rumors are flying about Despatch engineers' sensational development of a new type of finish-baking unit which is now undergoing final production tests.
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"Reduces baking costs" by eliminating rejects, avoiding costly test-runs and using heat more efficiently . . .
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Most automotive manufacturers have long depended on Detrex machines and chemicals in their metal cleaning operations.

And with the application of their efficient, mass production methods to the manufacture of war vehicles, they still turn to Detrex for their cleaning processes.

To meet the new conditions, Detrex has developed improved methods. Special machines and chemicals are applied to the fast, effective cleaning so necessary to war-winning production.

Today millions of parts for jeeps, trucks, half-tracks . . . as well as for aircraft, guns, control apparatus and other war material . . . are being cleaned the Detrex way.

DETREX CORPORATION
DETROIT 27, MICHIGAN

THEY GIVE THEIR LIVES . . . YOU LEND YOUR DOLLARS . . . Buy War Bonds

Manufacturers' Literature

Cleaning Equipment

Colt's Patent Fire Arms Mfg. Co., Dept. OF, Hartford, Conn., has published a 12-page booklet, *Metal Parts Cleaning Equipment*, describing the company's cleaning machines. Specifications are given for nine standard models which include gas and steam heated conveyor and rotary types for washing, rinsing and drying operations. The models are illustrated with photographs and dimensional drawings.

Copies of the booklet and complete information on standard or special cleaning equipment may be obtained by writing to the company.

Drying Oil Service Bulletins

A 16-page loose-leaf folder of technical service bulletins on the company's products has been issued by the Domestic Drying Oils division of *W. C. Hardesty, Inc.*, Dept. OF, 5636 E. 61st St., Los Angeles, Calif. The technical service bulletins include descriptions of Hardestoil No. 7, made from domestic linseed oils, and Hardestoil No. 11, made from domestic sardine oils. Physical and chemical properties and specifications are given for each of these materials along with information on handling technique. Both materials are made by the specially designed continuous Behr process.

Radiant Heat Drying Lamps

For drying, baking and heating processes, radiant heat drying lamps are recommended in a new illustrated booklet announced by *Westinghouse Electric and Manufacturing Co.*

The 12-page booklet tells what radiant heat is and discusses its advantages of speed, low initial and maintenance cost, flexibility and ease of control and reduced space requirements. In addition to discussing the design and performance characteristics of the drying lamp, the new booklet takes up the design of radiant heat installations, the arrangement and spacing of equipment and electrical circuit design. Specific data are given for the three general classes of applications for industrial purposes, namely, evaporation of water or other solvents, paint drying, and increasing temperatures of materials to facilitate manufacturing processes. Formulas are stated for determining the wattage required for each application.

Illustrations show radiant heat drying lamps installed to heat pistons, dry glue on paper envelopes, reduce spoilage in a lithographing company, dry molds at a foundry, bake varnish on armatures, rotors, stators and field pieces at an electric refrigerator repair shop, and speed up production and reduce spoilage in other industries.

A copy of booklet A-3817 may be secured from the Westinghouse Lamp Division, Dept. OF, Bloomfield, N. J.

Enamel Stripper

The Enthone Co., 442 Elm St., New Haven 2, Conn., has recently published a folder describing its Enamel Stripper "P," which is a phenolic base stripper that is used diluted with two or more volumes of water in the temperature range from 150-200°F.

The material, said to be free rinsing and to leave no oily or gummy residue, does not tend to layer or settle out because it forms clear dispersions with the water.

Specification Finishes

A new group of supplementary pages for its catalog, *U. S. Government Specification Finishes*, has been issued by *Lacquer and Chemical Corp.*, Dept. OF, 214-224 40th St., Brooklyn 32, N. Y.

Eight of the 18 supplementary pages are devoted to illustrations and descriptions of the research, manufacturing and testing facilities of the company. The remaining ten pages cover various government specification finishes including Ordnance Dept. lusterless lacquer enamel for ammunition (Spec. 3-162b), Army Air Corps protective coatings and finishes for aircraft wood surfaces (Spec. 24115) and Army-Navy Aeronautical black glyceryl-phthalate heat-resisting enamel (Spec. AN-TT-E-501).

Copies of the supplementary sheets or, for those not possessing the original catalog, complete catalogs may be obtained on request.

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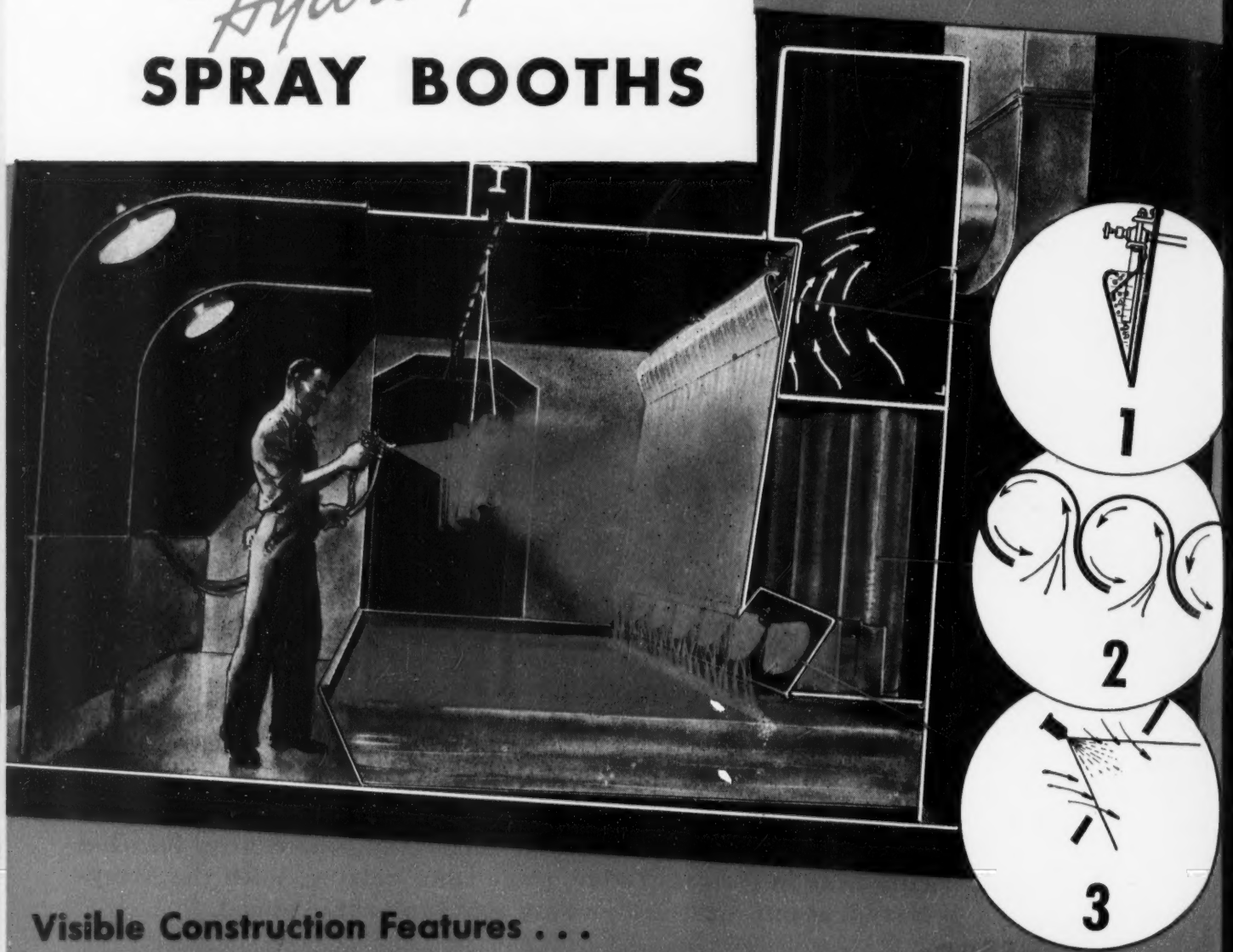

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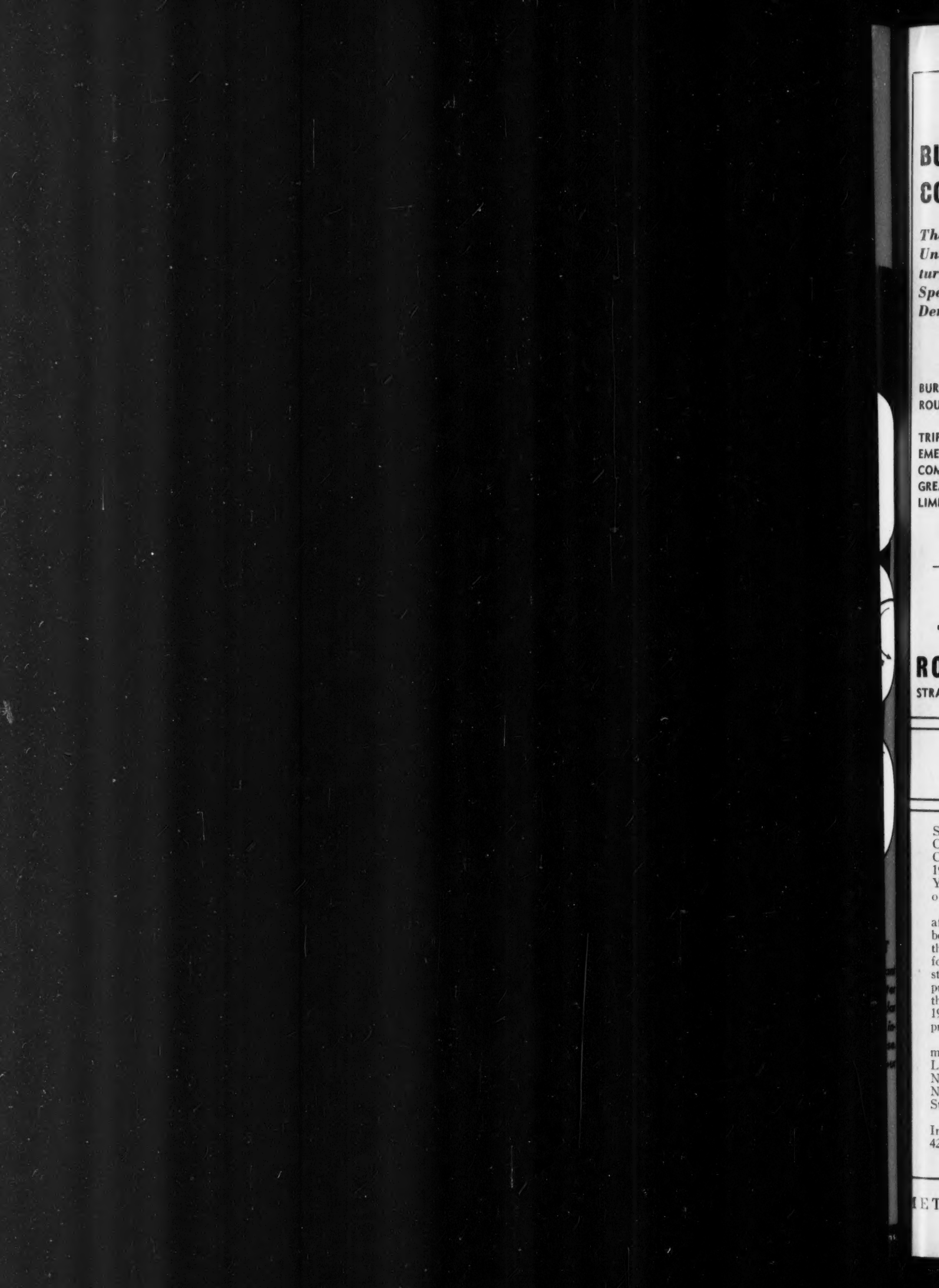

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS, OF AUGUST 24, 1912, AND MARCH 3, 1933, of METAL FINISHING, published monthly at New York, N. Y., for October 1, 1943, State of New York, County of New York, ss.:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Thos. A. Trumbour, who, having been duly sworn according to law, deposes and says that he is the Business Manager of METAL FINISHING and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are: Publisher, L. H. Langdon, 11 West 42nd Street, N. Y. Managing Editors, Nathaniel Hall and G. B. Hogaboom, Jr., 11 West 42nd Street, N. Y. Business Manager, Thomas A. Trumbour, 11 West 42nd Street, N. Y.

2. That the owner is: The Metal Industry Publishing Co., Inc., 11 West 42nd Street, N. Y.; L. H. Langdon, 11 West 42nd Street, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: L. H. Langdon, 11 West 42nd Street, N. Y.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

THOMAS A. TRUMBOUR, Business Manager.

Sworn to and subscribed before me this 30th day of Sept., 1943.
(Seal) H. LEONARD KINZEL
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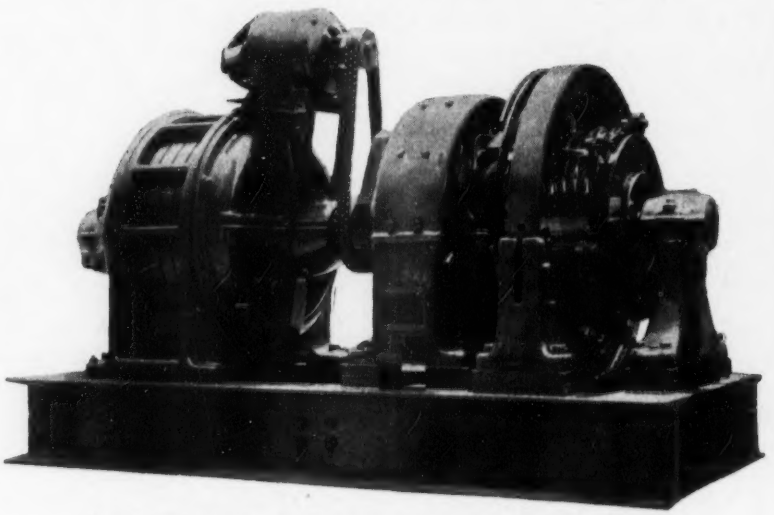

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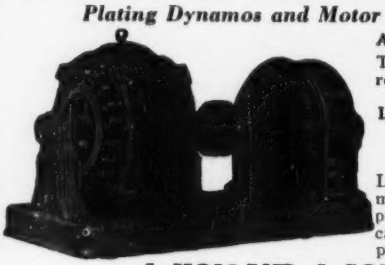

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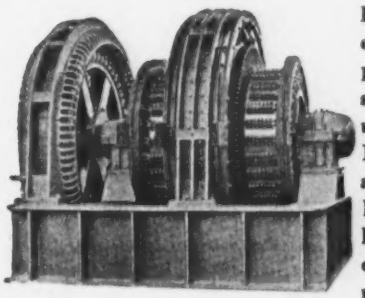

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SITUATION OPEN—Man to take charge of Barrel plating department. Must be familiar with cadmium, zinc and nickel. Also must have a knowledge of burnishing. Should be able to handle men and get out production. War work now, but future peace time work assured. Reply Box N3, care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

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SITUATION OPEN—Experienced barrel and still tank plating for modest plant, New York City. Permanent position for qualified man. Reply, giving all pertinent information. Box N2, Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

CHEMIST

SITUATION OPEN—Familiar with manufacture of Drawing Compounds . . . Los Angeles plant. Essential industry. Good salary. Address Box N1, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

SITUATIONS WANTED

PLATING EXECUTIVES

SITUATIONS WANTED—In response to our ad in the October issue, we have received several applications from plating executives who are seeking positions. If you have an opening, please address: Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

FOREMAN POLISHER

SITUATION WANTED—By polisher who has had several years of executive experience. Address Box Oct. 2, care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

INDUSTRIAL CLEANERS

SITUATION WANTED—Technical Executive—thoroughly experienced formulations — service — sales — All types of cleaners for all kinds of industries. Exceptionally versed in problems of the metal industry. Address Box Oct. 1, care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

ELECTRO-CHEMICAL ENGINEER

Many years experience in the field of hard-chromium plating of machine-parts, cutting-tools, etc., is desirous of a connection with a progressive firm in the New England area as a technical consultant. Address: Electro-chemical Engineer, care Metal Finishing, 11 West 42nd St., New York, N. Y.

SALESMAN

SITUATION WANTED—Salesman who has had over twenty years in sales and service, contacting every type of manufacture. Well versed in metal plating finishing. Can accept a position immediately. Address H. J., care Metal Finishing, 11 West 42nd St., New York.

REPRESENTATIVE

SITUATION WANTED—Inquiries solicited from firms selling metal finishing products and equipment seeking service and selling representation in Connecticut or New England. Have thorough technical background and practical experience in metal finishing processes. Address C C., care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

SUPERVISOR

SITUATION WANTED—Supervisor seeks situation; 22 years practical and technical experience in all phases of Electroplating and Metal Finishing; specification and production specialist; at present not employed to his ability; seeks change to capacity of ability. Address Nov. 10, care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

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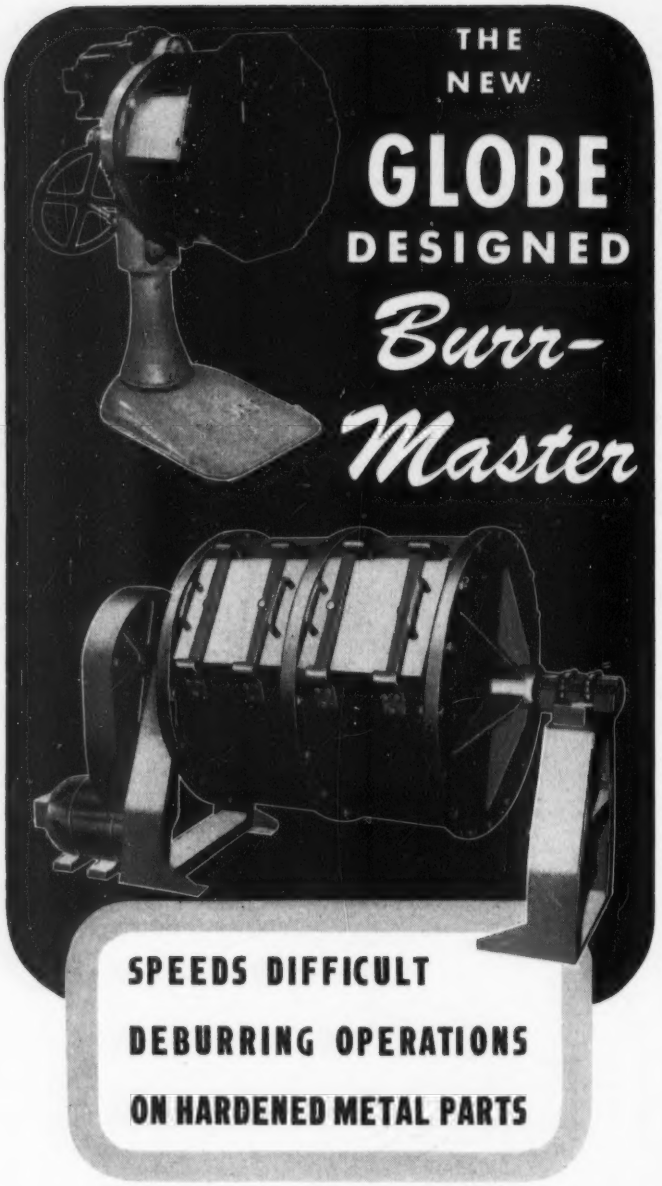

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ODDS and ENDS

Science Dep't:

Instructions in a jewelers' trade paper for preparing mounting cement: "In one pint of boiling water dissolve as much aluminum sulfate *as would take the space of the salt you put on one boiled egg.*" The author neglected to inform us as to whether the egg should be hard or soft boiled, but in any case we can't complain about his being too technical.

Slips that Pass:

We noticed the word *turnplate* in one magazine last month and presumed that *terneplate* was meant. However, we got to thinking about the word *turncoat* for no reason at all, which in turn suggested the word *ternecoat* which puts us back where we started, so we gave it up.

From an instruction manual: "Addition of excess caustic to the solution may cause the brightener to *participate.*" There is no point to using a brightener if it doesn't participate.

Incidentally, one of the more interesting uses for caustic soda is to put the gloss on pretzels. And for those sticklers for detail who insist on a formula, we add that the solution contains one pound of caustic in twenty gallons of water.

Labor Dep't:

A British firm offered an employee $2,500 per year to stay away from the factory because he was a troublemaker. We wish we could think of an appropriate comment.

George Hogaboom sent us a clipping from the "Help Wanted" columns of *The New York Times* calling for a *PLATER: No experience necessary.* This set us to wondering whether, since no experience makes one a plater, greater lack of experience made one a better plater. The subject finally became too confusing and we dropped it, but it does offer some interesting possibilities for contemplation.

Special Note to department heads who have trouble keeping their female help happy: *If you have a paint-spraying outfit, buy a large bottle of liquid leg make-up and let the girls use one of the spray guns to apply it during the lunch period.*

Newark Notes:

Were we surprised! The A.E.S. educational session started on time. *Frank Mesle,* who sounds better to us every time we hear him, thought the meeting was scheduled to start at 4:00 p.m. instead of 3:30 and timed his arrival accordingly. Whassamatter, Reverend, don't you read *Metal Finishing?*

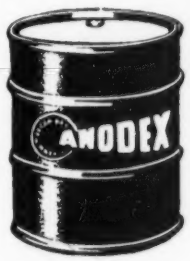
We saw more past presidents of the Supreme Society than at any meeting we ever attended. . . . Felt sorry for *George Wagner* and *Horace Smith,* the guests of honor at the banquet—sitting up on the dais with nothing to do but twiddle their thumbs while all we common people down below were having a good time. Especially Horace, who was missing an excellent opportunity to sell raffle tickets. . . . Made a mental note that if anyone ever honors us while we are still alive, which we doubt, we want to sit with the rest of the gang.

Wilfred McKeon looking as chipper as ever. . . . Wonder whether it's due to his being out of range of Liquid Sulphur for a month or whether smelling the stuff again makes him feel better? . . . If *Ed Washburn* would shrink himself down to our size he wouldn't be spending half his time pulling the microphone up to his altitude. *George Gehling* has toned down his voice to a mere bellow. . . . We were only fifty feet away and he didn't even blow the collar off our beer.

Words and Music Dep't:

To settle the argument once and for all (we hope), our *Unabridged* has the following to say: The words adherence and adhesion, which were once freely interchanged, are now almost entirely separated. *Adherence* is no longer used to denote physical union but is applied to mental states or habits; as, a strict *adherence* to one's duty, etc.

Special note for M. B. D.: It's still *adhesion* of a deposit and not *cohesion.* Our dictionary also has this to say: *Cohesion:* That form of attraction by which the particles of a body are united *throughout the mass,* whether like or unlike; distinguished from *adhesion,* which unites bodies by their *adjacent surfaces.*



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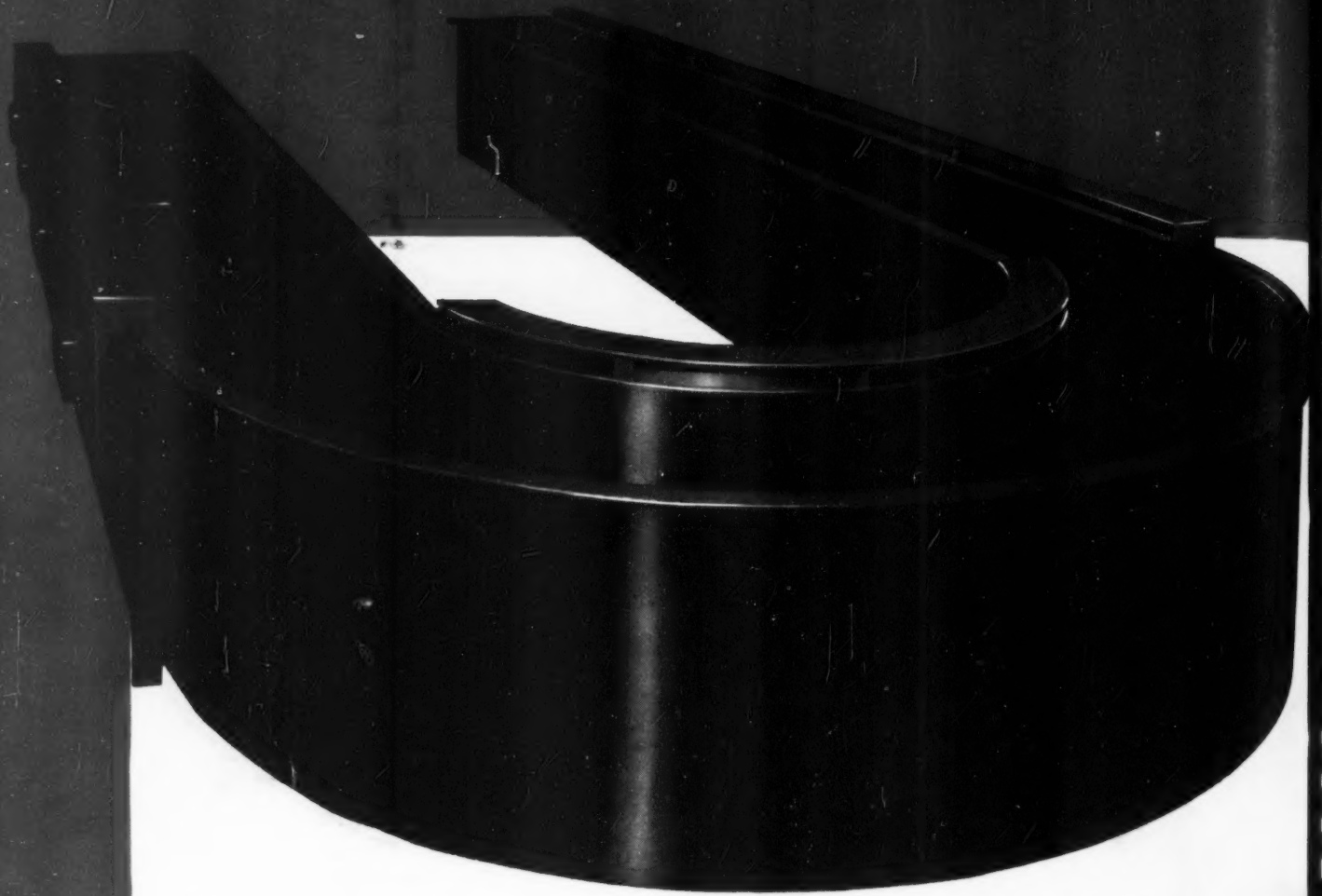

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